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1896.

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PROCEEDINGS

OF THE

GENERAL MEETINGS FOR SCIENTIFIC BUSINESS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

January 14, 1896.

Dr. W. T. Blanford, F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of December 1895:—

The total number of registered additions to the Society's Menagerie during the month of December was 98, of which 57 were by presentation, 1 by exchange, 34 by purchase, and 6 were received on deposit. The total number of departures during the same period, by death and removals, was 92.

Amongst these attention may be called to the two specimens of Forsten's Lorikeet (*Trichoglossus forsteni*), obtained by purchase. Of this scarce Parrot no examples have been previously received by the Society, and the species appears to be unrepresented in the British Museum (see Cat. Birds B. M. xx. p. 51).

Mr. W. B. Tegetmeier exhibited some drawings by Mr. Frohawk of two young King-Penguins (*Aptenodytes forsteri*) in down plumage, living in the Society's Gardens.

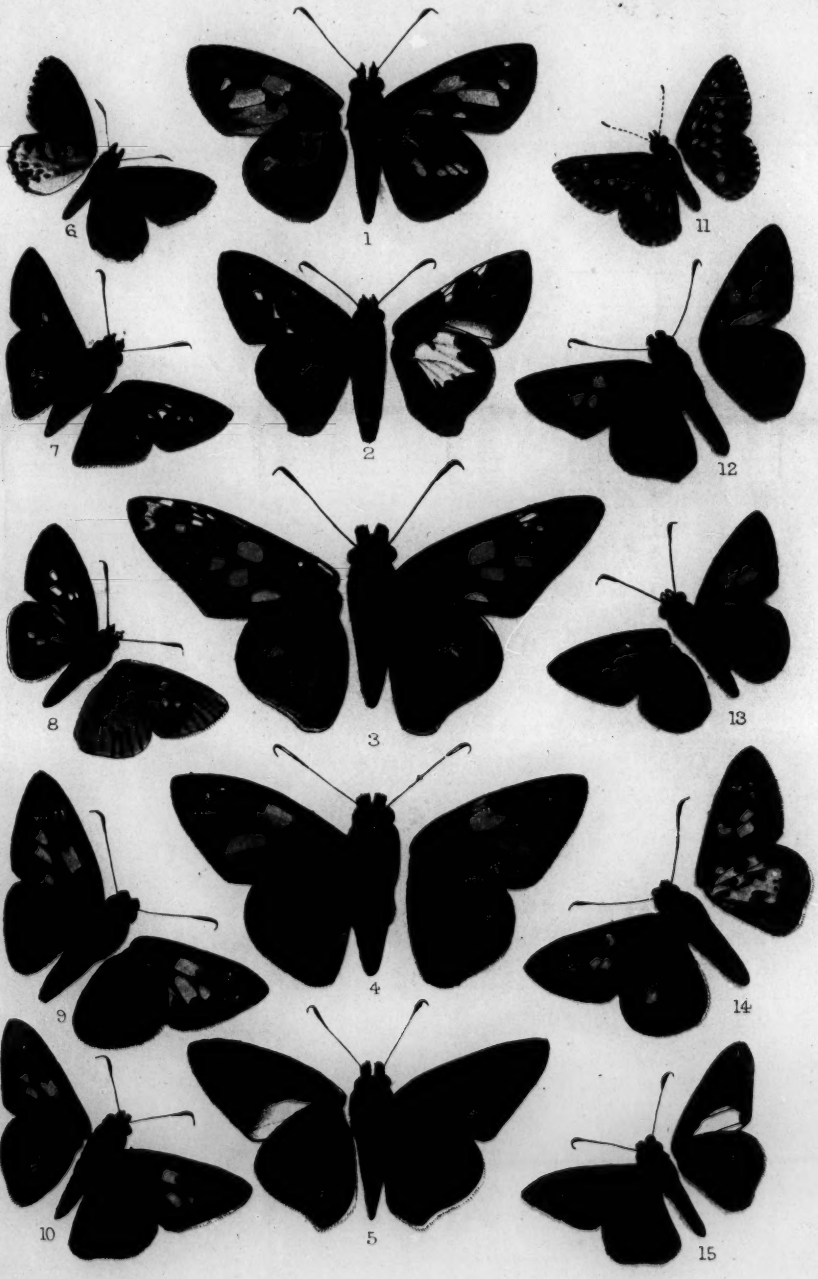
The following papers were read:—

1. A Preliminary Revision and Synonymic Catalogue of the *Hesperiidæ* of Africa and the adjacent Islands, with Descriptions of some apparently new Species. By W. J. Holland, Ph.D., F.Z.S., F.E.S., &c., Chancellor of the Western University of Pennsylvania.

[Received November 6, 1895.]

(Plates I.–V.)

Having been for a number of years past engaged in the diligent study of the Lepidoptera of Tropical Western Africa, and having been compelled in the prosecution of these studies to acquaint myself with the entire literature of the subject, it has occurred to me that it might facilitate the labours of others, who may be tempted to embark upon the same line of investigation, or who may already be involved in the tangled mazes of the subject, if I should at least attempt to bring together into one paper the scattered references to the various species. I have therefore begun a synonymic catalogue of the Diurnal Lepidoptera of the African Continent and the adjacent Islands, but am led by the advice of trusted friends to anticipate the publication of the more extended catalogue by the following paper, in which is contained a list of a very difficult group of Butterflies included in the fauna. I am led the more readily to take this step in view of the results of the recent labours of Lieut. E. Y. Watson, who, in a paper recently published in the Proceedings of the Zoological Society upon the Classification of the *Hesperiidæ* (P. Z. S. 1893, p. 3), has laid solid foundations for the prosecution of systematic researches in the future. I have in the main followed the classification which he has suggested in his valuable paper, which, while confessedly incomplete, and leaving some things to be desired, is, nevertheless, one of the most notable contributions to the literature of the subject which has recently appeared. Based, as it is, upon an accurate and painstaking examination of the anatomical details and structural peculiarities of the various species represented in the collections of the British Museum and the magnificent collection of Messrs. Godman and Salvin, it may in the main be accepted as free from the blemishes which characterize much of the work done in this group by authors, who have relied almost wholly upon superficial resemblances. In the few cases in which I have departed from the classification of Lieut. Watson, it has been because I have been able to make more careful anatomical investigations than it was possible for him to do with the material at his command. A private collector may do as he will with his own, and may bleach and dissect specimens, when it would be little less than a crime for the authorities of a Museum like that at South Kensington to allow such treatment to be bestowed upon the



West, Newman chromo lith.

African Hesperiidæ.

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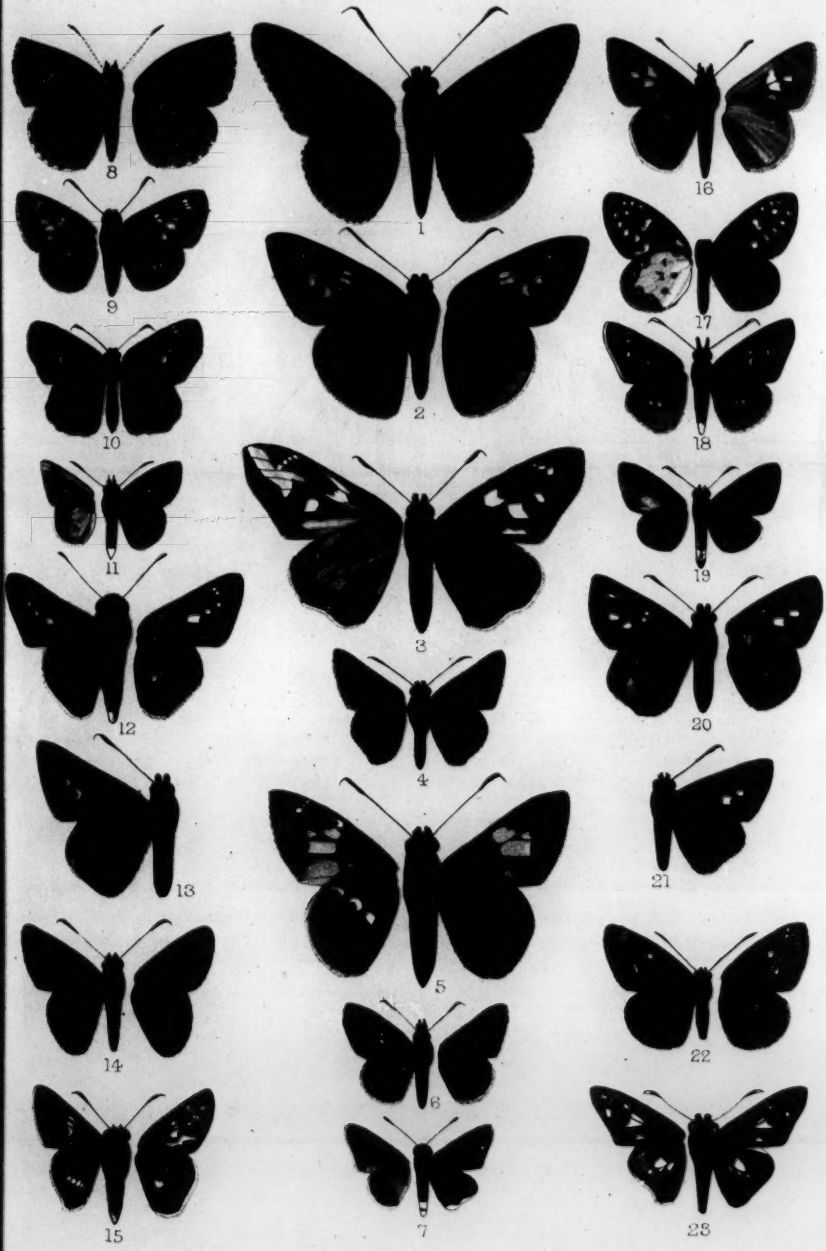

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African Hesperidæ.

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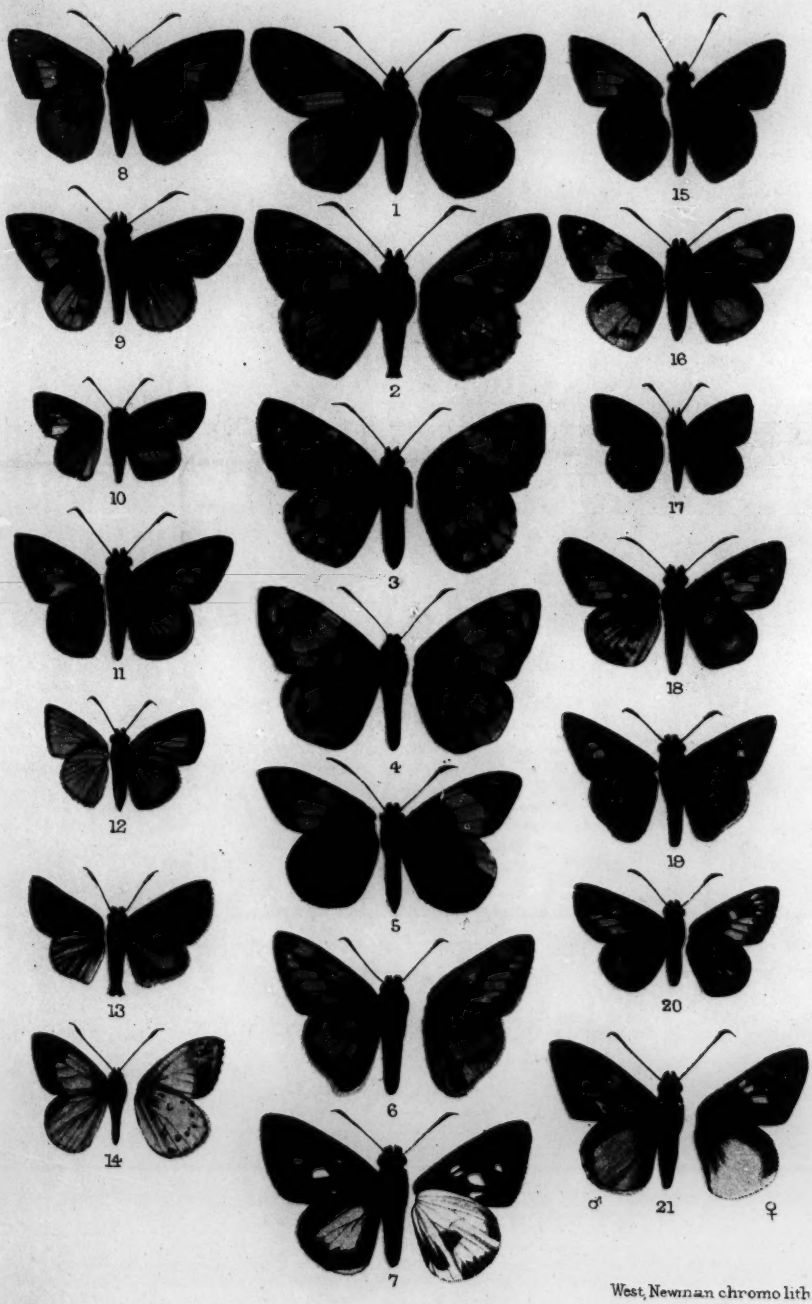

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African Hesperiidæ.

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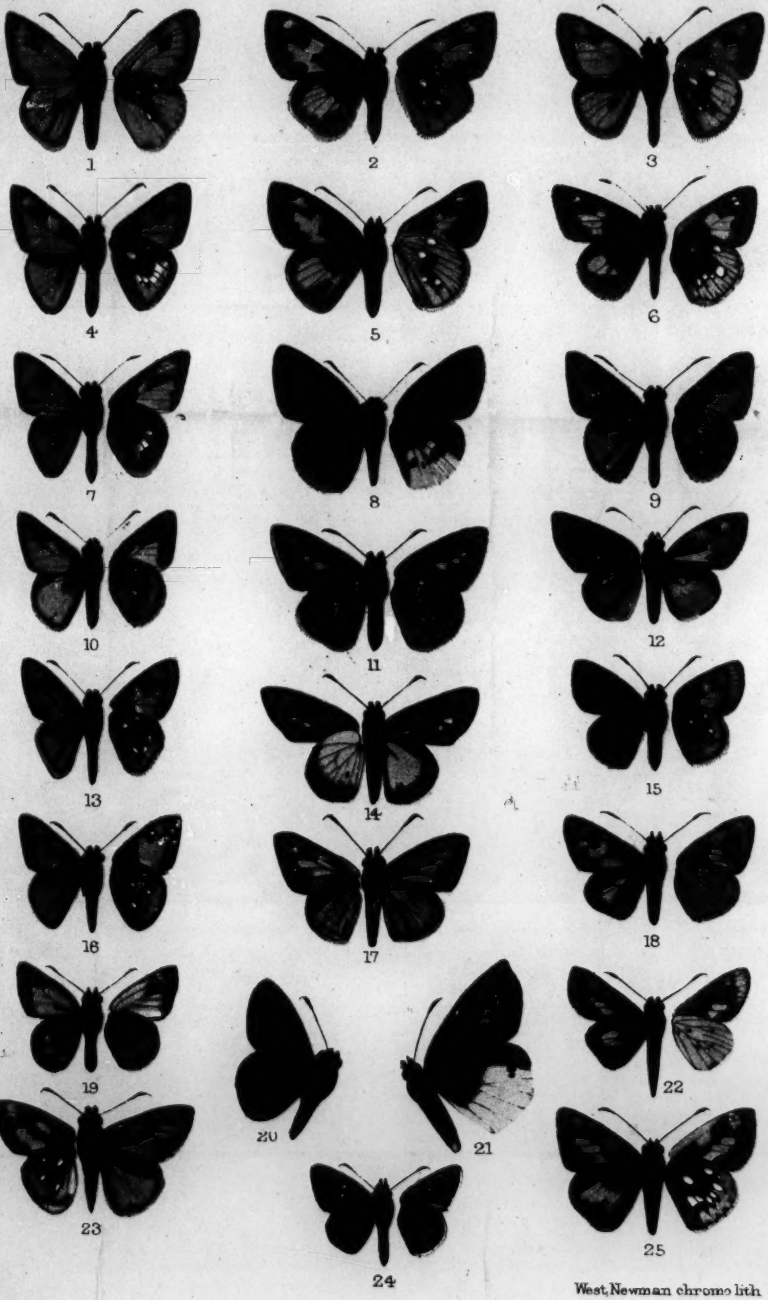

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African Hesperiidæ.

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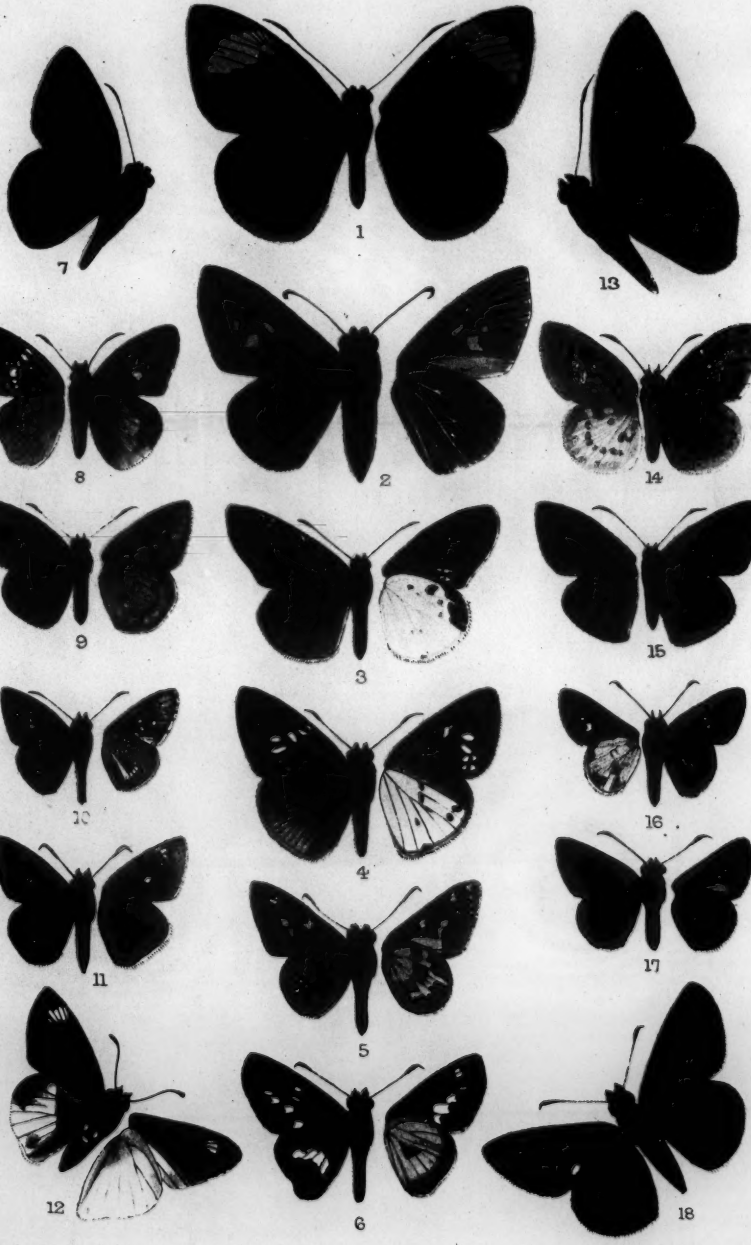

West,Newman chromo lith.

African Hesperiidæ.

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precious types of Hewitson and other great naturalists, who have placed their collections in the care of the institution.

In following up my labours I have been greatly aided by the possession of a large mass of well determined Indian material, which I have been accumulating for many years past, and particularly by the possession of the Knyvett collection, for which I am indebted to the generous kindness of Mr. Andrew Carnegie, my distinguished fellow-townsman, whose interest in all things relating to the advancement of science is well known. I have derived much assistance from the collections which I have received from Mr. William Doherty, the well-known naturalist explorer of the far East, and from the collections for which I am indebted to Mr. L. de Nicéville, of Calcutta, whose great work upon the Lepidoptera of India is a monument to his painstaking diligence and scientific acumen. I am no less indebted to Mr. Roland Trimen, the late learned Curator of the South-African Museum at Capetown, whose labours upon the fauna of extra-tropical Africa are classic, and who with the most engaging kindness has presented me with authentically determined specimens of most of the species named by him. It is much to be wished that all authors might acquire those habits of exact observation and clear description which are possessed by this Nestor among lepidopterists, whose diagnoses of the various species contained in his last work upon the Butterflies of South Africa are so exact as almost to make the work of pictorial representation superfluous. I am under very special obligations to the authorities of the British Natural History Museum not only for permission to freely study the collections in their possession, but for permission to have drawings made of the hitherto unpublished types of the late Mr. Hewitson and of Dr. Butler. I have to thank Dr. Karsch of the Berlin Museum, and Dr. Rogenhofer of the Imperial Museum at Vienna, for similar kindnesses. From Mons. Mabille of Paris I have received most distinguished courtesies, and I am indebted to him for the opportunity to examine personally the types of many of his recently described species, and for the use of a number of copies of the unpublished figures of Ploetz. Ploetz made no collection of specimens during his lifetime, but contented himself with making drawings, not always very accurate, of the species which he described in the collection of others, or which he found figured in various works. These figures are in many cases our only safe clue to a knowledge of the species he named, for his descriptions are in many instances very unsatisfactory. I cannot fail in this connection to express my indebtedness to Lieut. Watson, who compared many of the species in my collection with the types in the British Museum, and assigned them to the respective genera to which they belong in his classification, and to Dr. Butler and Mr. Herbert Druce for their generous assistance at all times freely given. Among American entomologists, I am especially indebted to Dr. S. H. Scudder of Cambridge, who, upon the occasion of his last visit to Europe, did me the great favour of comparing a series of drawings of the species

in my collection with the types in the Berlin Museum and in the Museums of Paris and London. But great as is the debt of gratitude I owe to these valued friends and colabourers, it is even exceeded by my obligations to Dr. Otto Staudinger of Dresden, who entrusted to the ocean all the types of African *Hesperiidæ* and all the unnamed material in his vast collection, and freely sent them to me for purposes of study and comparison. For this act of great generosity I cannot sufficiently thank him.

In submitting the following pages to the attentive consideration of specialists, it is with a sense of the manifold defects which must in the lapse of time be found to be contained therein. With the exercise of the utmost care, and with all the help of the learned, errors are unavoidable. In all cases where doubt attaches in my mind to a generic reference, it is indicated. Absolute certainty in this respect is not easily attained in some cases. While two-thirds of the species accredited to the African fauna are represented in my own collection, in some cases by enormously large series of specimens, and I have seen in nature probably four-fifths of the species of the *Hesperiidæ* which have been described as coming from Africa, nevertheless in not a few cases I have been compelled to rely wholly upon illustrations and the suggestions of resemblance made by authors for an approximate location of the species. Yet, in spite of the defects which must of necessity exist in this work, I venture to express the confident belief that it will be found to mark a distinct advance in our knowledge of the subject.

RHOPALOCERA.

Fam. HESPERIIDÆ.

Subfam. HESPERIINÆ.

SARANGESA, Moore.

(*Hyda*, Mab.; *Eretis*, Mab.; *Sape*, Mab.)

The differences of a structural character between the species assigned to the genus *Eretis*, Mab., and *Sarangesa*, Moore, are so slight as in my estimation not to justify a separation, except subgenerically. The principle difference is in the waved outline of the secondaries and the relatively longer fringes in the form *Eretis*.

* ERETIS, Mab.

1. S. DJÆLÆLÆ, Wallgr.

Pterygospidea djælælæ, Wallgr. K. S. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 54, no. 5.

Nisoniades umbra, Trim. Trans. Ent. Soc. Lond. (3) vol. i. p. 289 (1862).

Nison. djælælæ, Trim. Rhop. Afr. Austr. vol. ii. p. 311, no. 204 (1866).

Pterygos. djœlœlæ, S. Afr. Butt. vol. iii. p. 254, pl. xii. fig. 7, ♀ (1889).

Hab. S. Africa.

Lieut. Watson, P. Z. S. 1893, p. 48, calls attention to the fact that the species in the British Museum which has been identified by Mr. Butler from various localities in Northern and Eastern Africa as *S. djœlœlæ*, Wallgr., is not that species, and is apparently unnamed. This form, which is common in Abyssinia and elsewhere, is more closely related to *S. motozi*, Wallgr., and falls into the subgenus *Sape* of Mabille. Mons. Mabille, I discover, has labelled it as *S. nerva*, Fabr., in the collection of Dr. Staudinger, and so also has labelled it for me. It certainly is not the insect described under this name by Fabricius, and I have therefore ventured elsewhere to name and describe it (vide *S. eliminata*, Holl., p. 9).

2. S. LUGENS, Rogenhfr. (Plate II. fig. 10.)

♀ (♂ sec. Rghfr., sed non sec. Rebel). *Pterygospidea* (*Tagiades*, Ploetz) *lugens*, Rogenhfr. Ann. Hofmus. Wien, vol. vi. p. 46 (1891).

♂. *Pterygospidea morosa*, Rogenhfr. Ann. Hofmus. Wien, vol. vi. p. 463 (1891).

Hab. Marangu, Tropical Africa (*Von Hoehnel*).

I am under profound obligations to Dr. Rogenhofer, of the Imperial Museum in Vienna, and to Dr. Rebel, his assistant, for having kindly furnished me with most carefully executed drawings of the two forms characterized as above by Dr. Rogenhofer. Dr. Rebel writes me as follows:—"I have taken occasion to critically examine the two unique types of *P. lugens*, Rghfr., and *P. morosa*, Rghfr., and have positively ascertained that both names apply to one species. The name *lugens*, Rghfr., must stand, inasmuch as it is the first in the order of publication. Rogenhofer is in error in regarding the type of *lugens* as a male; it is most positively a female. The name *morosa* must therefore sink as a synonym (= ♂ of *lugens*)."

3. S. MELANIA, Mab.

Eretis melania, Mab. C. R. Soc. Ent. Belg. 1891, p. lxxi; Watson, P. Z. S. 1893, p. 48; Karsch, Berl. Ent. Zeit. Bd. xxxviii. p. 264, ♀ ? (1893).

Hab. Gaboon; Togoland?

Dr. Karsch refers a female before him with doubt to the species described by Mabille. In the vast series of specimens which I have received from Gaboon, I have never found one which tallies exactly with the type or description of Mons. Mabille. I thought that the following species might be the same, but having compared my type with the original type of *E. melania* in the collection of Dr. Staudinger, I am quite sure of the distinctness of the two species. *S. melania* may be readily distinguished from *S. perpaupera*, which it closely resembles at first sight, by the fact that the fringes

of the primaries, which are fuscous, are checkered with black at the ends of the nervules, and are conspicuously white at the apex and at the inner angle. The specimen in Dr. Staudinger's collection is labelled "*melanina*" in the handwriting of Mons. Mabille. The published name is *melania*, and this of course stands.

4. S. PERPAUPERA, Holl.

Sarangesa perpaupera, Holl. Ann. & Mag. Nat. Hist. (6) vol. x. p. 288 (1892); Ent. News, Jan. 1894, pl. i. fig. 1, ♂.

Hab. Upper Valley of the Ogové River (*Good*); Angola (*Staudinger*).

5. S. EXPROMPTA, Holl.

Sarangesa exprompta, Holl. Ent. News, Jan. 1894, p. 26, pl. i. fig. 3, ♂.

Hab. Accra.

The type was purchased from Doncaster with a lot of other African material. Whether the locality label attached to the specimen is correct I cannot be positively certain, as some of the things bought at the time were plainly not from the localities indicated upon the labels.

6. S. ASTRIGERA, Butl. (Plate II. fig. 8.)

S. astrigera, Butl. P. Z. S. 1893, p. 669.

Hab. Zomba, British Central Africa.

I only know this species by the description given by the author, and the figure prepared by Mr. Horace Knight, which is reproduced upon the plate. I place it in this section of the genus with much doubt, but it plainly belongs here, rather than elsewhere.

** HYDA, Mab.

7. S. GRISEA, Hew.

Pterygospidea grisea, Hew. Ann. & Mag. Nat. Hist. (5) vol. i. p. 344 (1878).

Hyda micacea, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. clxvii (1889); Novit. Lepidopt. p. 93, pl. xiii. fig. 3 (1893).

Hab. Gaboon, Liberia.

Weymer in Stübel's 'Reise,' p. 126, pl. iv. fig. 5, describes and illustrates a species from Ecuador as *Hesperia micacea*. Inasmuch as Mabille's name drops as a synonym in the case of the present species, that of Weymer should be allowed to stand for the species he named.

8. S. TRICERATA, Mab.

Hyda tricerata, Mab. C. R. Soc. Ent. Belg. 1891, p. cvi; Novit. Lepidopt. p. 92, pl. xiii. fig. 2.

Hab. Sierra Leone, Cameroons, Gaboon.

9. S. MAJORELLA, Mab.

Hyda majorella, Mab. C. R. Soc. Ent. Belg. 1891, p. cvii; Novit. Lepidopt. p. 92, pl. xiii. fig. 1 (1893).

Eretis motozi, Wallgr. (?), Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 264, pl. vi. fig. 11 (1893).

Hab. Sierra Leone (*Mabille*); Togoland (*Karsch*).

*** SAPE, Mab.

10. S. LUCIDELLA, Mab. (Plate II. fig. 22.)

Rape lucidella, Mab. C. R. Soc. Ent. Belg. 1891, pl. lxvii.

The type specimen in the collection of Dr. Staudinger is somewhat worn, but shows that the insect is abundantly distinct from the other species herein enumerated. This is brought out clearly in the figure given.

11. S. MOTOZI, Wallgr.

♀. *Pterygospidea motozi*, Wallgr. K. Sv. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 53; ♀, Trim. Rhop. Afr. Austr. vol. ii. p. 313, no. 206, pl. vi. fig. 3; ♂ and ♀, Trim. S. Afr. Butt. vol. iii. p. 356 (1889).

♀. *Nisoniades pato*, Trim. Trans. Ent. Soc. Lond. (3) vol. i. p. 404 (1862).

Hab. South Africa.

12. S. MOTOZIOIDES, Holl.

Sarangesa motozioides, Holl. Ann. & Mag. Nat. Hist. (6) vol. x. p. 288 (1892); Ent. News, Jan. 1894, pl. i. fig. 5, ♀; Butl. (?), P. Z. S. 1893, p. 668.

Hab. Transvaal (*in Staudinger's collection*); Gaboon (*Good*).

The male described by me in the 'Annals and Magazine of Natural History,' and subsequently figured in the 'Entomological News,' turns out to be the male of the species described by Mabille as *Pterygospidea bouvieri*, if thorough reliance may be placed upon the identification made in the collection of Dr. Staudinger by Mons. Mabille, the author of the species. So far I have not been able to find in any collection a true male of *S. motozioides*, Holl. The female may be separated at a glance from the female of *S. motozi* by the absence of the conspicuous translucent spot in the cell of the secondaries, which is characteristic of *motozi*, Wallgr., and by the fact that the translucent spots in the primaries are much smaller than in typical *motozi*.

13. S. SYNESTALMENUS, Karsch.

Antigonus synestalmenus, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 263, pl. vi. fig. 8 (1893).

This species is very closely allied upon the upper surface to

S. bouvieri, Mab., and *S. pertusa*, Mab., but upon the underside reveals great differences.

Hab. Togoland (*Karsch*).

14. S. PERTUSA, Mab.

Sape pertusa, Mab. C. R. Soc. Ent. Belg. 1891, p. lxviii.

Hab. Transvaal.

The type would seem to indicate that this is only a slight variety of *motozi*, Wallgr.

15. S. BOUVIERI, Mab.

Pterygospidea bouvieri, Mab. Bull. Soc. Zool. France, 1877, p. 239.

Sarangesa motozioides, ♂, Holl. Ann. & Mag. Nat. Hist. (6) vol. x. p. 288 (1892); Ent. News, Jan. 1894, pl. i. fig. 4, ♂.

For the determination of this species I am indebted to Dr. Staudinger, who has loaned me a male and female determined for him by the author of the species. By the description originally given by Mons. Mabille, I should not have been able to reach a positive conclusion, as the description seems to be somewhat inadequate.

16. S. THECLA, Ploetz. (Plate V. fig. 14.)

Antigonus thecla, Ploetz, S. E. Z. vol. xl. p. 361 (1879).

Sape semialba, Mab. C. R. Soc. Ent. Belg. 1891, p. lxvii; Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 262.

By comparison of the type of Mons. Mabille with a figure of the type of Ploetz, which is reproduced in the plates accompanying this article, I am able to positively affirm the identity of the two.

Hab. Aburi (*Ploetz*); W. Africa (*Mabille*); Cameroons (*Good*); Togoland (*Karsch*).

17. S. THECLIDES, sp. nov. (Plate V. fig. 3.)

♂. Antennæ black, slightly lighter on the underside, the upperside of the palpi, thorax, and abdomen is fuscous. The lower side of the palpi is yellowish. The lower side of the thorax and abdomen is pure white. The legs are white, narrowly edged with blackish upon the anterior margins. The ground-colour of the upperside of the primaries and secondaries is fuscous ochraceous. The primaries are heavily bordered with black on the outer margin, and there is a large irregularly quadrate spot of the same colour on the costa near the end of the cell, limited anteriorly by four minute white translucent subapical spots and posteriorly by three like spots, two of them in the cell near its end and one of them above near the costa. The primaries are further ornamented by a series of small white translucent spots, bordered inwardly by blackish. These spots are arranged in a straight transverse series,

two in cell 1, one, transversely elongated, in cell 2, and a smaller one in cell 3. The secondaries are heavily marked with black on the outer angle, and there is a curved series of three or four small black spots in the subcostal interspaces. Just after the large black spot on the outer angle, the outer margin is lightly touched with whitish. A fine dark marginal line defines the origin of the cilia, which are fuscous upon the upperside. On the underside the primaries are blackish, shading slightly into bluish grey at the base. The translucent spots appear as on the upperside; the two spots in cell 1 being defined outwardly by two parallel whitish rays. The secondaries are white, laved with bluish grey at the base. The outer angle is black. The black spots on the subcostal interspaces are as on the upper surface, but more clearly defined upon the white ground. In addition there are two small discal dots in cell 1, and a small black dot on the outer margin near the extremity of vein 1. The cilia on the underside are white toward the anal angle.

Expanse 35 mm.

Hab. Gaboon (*Mocquerys*). Type in collection Staudinger.

18. S. ELIMINATA, sp. nov. (Plate V. fig. 9.)

♂. The colour of the upperside of the thorax and abdomen is dark fuscous, of the underside yellowish ochraceous. The antennæ are black, the legs grey, edged with blackish anteriorly. The primaries on the upperside are fuscous. There are three small confluent subapical spots, a similar small spot on the upper edge of the cell near its end, and two other like spots in cells 2 and 3, of which the former is the larger. Both the subapical series and the discal spots are followed inwardly by dark cloudings. The interspaces just before the margin are marked by obscure darker oblong spots. There is a fine dark marginal line. The cilia are fuscous. The secondaries are traversed by a series of obscure dark fuscous transverse median, limbal, and submarginal spots. The spot of the median series located at the end of the cell is annuliform. The marginal line and cilia are as on the primaries. Both the primaries and secondaries on the underside are clear yellowish ochraceous, with the cilia pale fuscous. The inner margin of the primaries is testaceous. The translucent spots of the upper surface reappear upon the lower side and are narrowly margined with fuscous. Fuscous submarginal and limbal bands traverse the primaries, leaving sagittate spots of the prevailing ground-colour between them on the intra-neural spaces. The secondaries show the transverse series of spots of the upper surface, but more distinctly defined and generally rounded than on the upperside.

♀ like the male.

Expanse 28–30 mm.

Hab. Abyssinia (*Staudinger*); Somaliland (*in my collection*).

This species is labelled in the Staudinger collection by Mons. Mabille as "*nerva*, Fabr." Mons. Mabille has on several occasions in his correspondence with me insisted upon employing the Fabri-

cian name for this insect. Perhaps he is following in this the example of Ploetz, who referred some insect obtained from Kordofan to the Fabrician species. But, whatever may have been the insect before Ploetz at the time he was writing, it is certain that it was not the insect described by Fabricius. In Jones's 'Icones' (unpublished) we have the best clue to many of the Fabrician species, and the figure of *H. nerva* there given (vide pl. 72. fig. 3) represents undoubtedly a species of *Hesperia* (*Pyrgus*, Hübn. et auct.). The published references to *Hesperia nerva*, Fabr., are the following:—

Hesperia nerva, Fabr. Ent. Syst. iii. p. 340, no. 293 (1793); Latreille, Enc. Méth. ix. p. 789, no. 162 (1823).

Pyrgus nerva, Butl. Fabr. Diurn. Lep. p. 282 (1869).

Ephyriades nerva, Ploetz, JB. Nass. Ver. xxxvii. p. 6 (1884).

The habitat of *H. nerva* is given by Fabricius as "*in Indiis*," to which little significance need be attached, as we know that this phrase with the old writers often meant no more than that the insect came from a foreign country.

19. S. AURIMARGO (Mab. MS.), sp. nov. (Plate IV. fig. 8.)

Tabraca aurimargo, Mab. *in literis*.

♂. The antennæ and the upperside of the thorax and abdomen are black, as is also the underside of the thorax and abdomen, except at the anal extremity, where it is marked with orange-yellow; the ground-colour of the primaries and secondaries is dark brown, almost black. The primaries are ornamented by three minute translucent subapical spots in the usual position. The outer margin of the secondaries near the anal angle and the cilia for the inner half of the wing are orange. On the underside, the primaries are coloured and marked as upon the upperside. The secondaries have the orange colour which appears upon the upperside near the anal angle much more broadly diffused, covering the outer half of the wing as far as the subcostal nervules. The costal margin and the base are broadly blackish brown, and the yellow space is interrupted by an irregular row of discal spots, of which the one opposite the end of the cell is the largest and confluent with the dark costal area.

Expanse 28–30 mm.

Hab. Gaboon (*Mocquerys*); Sierra Leone (*Preuss*). Types in coll. Staudinger.

This beautiful species has been named *Tabraca aurimargo* by Mons. Mabille. In neuration and most other respects it agrees with *Sarangesa* absolutely, and I cannot bring myself to recognize in it the type of a new genus.

20. S. MACULATA, Mab.

Sape maculata, Mab. C. R. Soc. Ent. Belg. 1891, p. lxviii.

Hab. Mozambique (*Mabille*).

I have no clue to the determination of this species other than the description of the author.

21. S. OPHTHALMICA, Mab.

Sape ophthalmica, Mab. C. R. Soc. Ent. Belg. 1891, p. lxviii.

Hab. Delagoa Bay (*Mabille*).

No specimen or figure of this species being available, I must content myself with a provisional reference to this location in the genus, to which the author has assigned it.

22. S. (?) PLISTONICUS, Ploetz.

Antigonus plistonicus, Ploetz, S. E. Z. vol. xl. p. 362 (1879).

Hab. Aburi (*Ploetz*).

I cannot make out this species from the description and the material before me. The description does not exactly apply to anything I have seen in nature, though it may be that it designates some already well-known species.

23. S. (?) PHILOTOMUS, Ploetz.

Antigonus philotomus, Ploetz, S. E. Z. vol. xl. p. 361 (1879); Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 262 (1893).

Hab. Aburi (*Ploetz*); Togoland (*Karsch*).

I do not know this species, at least under this name.

24. S. (?) LÆLIUS, Mab.

Pterygospidea lælius, Ploetz MS., Mabille, Bull. Soc. Zool. France, 1877, p. 240

Ephyriades lælius, Ploetz, JB. Nass. Ver. xxxvii. p. 6.

Hab. Gaboon.

This is another species about which I am left in total uncertainty. Ploetz merely cites the name, and from the description of Mons. Mabille I cannot draw positive conclusions. Mons. Mabille has designated for me under this name two wholly different species, one being the species which he has labelled in the collection of Dr. Staudinger as *bouvieri*, and the other being a slight variety of *S. thecla*, Ploetz, which he named from a photographic representation sent to him, in which only the upperside appeared. I leave this puzzle somewhat reluctantly to others to solve.

25. S. KOBELA, Trim.

Nisoniades kobela, Trim. Trans. Ent. Soc. Lond. (3) vol. ii. p. 180 (1864); Rhop. Afr. Austr. ii. p. 312, pl. vi. fig. 4, *o* (1866).

Pterygospidea kobela, Trim. S. Afr. Butt. vol. iii. p. 353 (1889).

Sarangesa kobela, Watson, P. Z. S. 1893, p. 48.

Hab. Extra-tropical South Africa (*Trimen*).

This species reveals a striking superficial resemblance to the species of the genus *Thanaos*, and represents a section of the genus in which it stands thus far unique.

CELÆNORRHINUS, Hübn.

26. C. GALENUS, Fabr.

Hesperia galenus, Fabr. Ent. Syst. iii. 1, p. 350, no. 332 (1793); Latr. Enc. Méth. ix. p. 773, no. 124 (1823).

Hesperia galena, Don. Ins. Ind. pl. l. fig. 3, ♀ (1800).

Celænorrhinus galenus, Wats. P. Z. S. 1893, p. 49.

Plesioneura galenus, Staudgr. Exot. Schmett. pl. 100.

Pardaleodes fulgens, Mab. Bull. Soc. Zool. France, 1877, p. 236, ♂.

Pterygospidea galenus, Trim. P. Z. S. 1894, p. 80.

Donovan in his plate figures the female of this species, which may always be recognized by the elongate marginal spot on the secondaries beyond the end of the cell. This spot has the form of a parallelogram, and does not fuse with the adjacent spots so fully as is the case in the male, where its sharp outlines are lost in the spots on either side of it. Dr. Staudinger gives a good figure of the male in his 'Exotische Schmetterlinge.' Mons. Mabille kindly determined for me a number of species upon the occasion of a recent visit to Paris, among them *Pardaleodes fulgens*, Mab. The specimens so determined are undoubtedly *C. galenus*, Fabr., ♂. I have a series of nearly 100 specimens of both sexes, some of them taken *in coitu*, and am satisfied of the correctness of the synonymy given as above.

This is one of the commonest of West-African butterflies and is found from Senegambia to Upper Angola, and Manica (*Trimen*).

27. C. RUTILANS, Mab.

Pardaleodes rutilans, Mab. Bull. Soc. Zool. France, 1877, p. 235, ♀; Bull. Soc. Ent. France (Feb. 1877), ♀; Novit. Lepidopt. p. 96, pl. xiii. fig. 7, ♂ (1893).

Pterygospidea tergemira, Hew. Ann. & Mag. Nat. Hist. (4) vol. xx. p. 323 (Oct. 1877).

Tagiades woermanni, Ploetz, S. E. Z. vol. xl. p. 362, ♀ (1879).

Having seen the types of *P. rutilans*, Mab., and of *P. tergemira*, Hew., and a carefully executed copy of the drawing of *T. woermanni*, ♀, made by Ploetz, I have not a shadow of doubt as to the correctness of the above synonymy.

Hab. Fernando Po (*Hewitson*); Victoria, W. Africa (*Ploetz*); Congo-Landana (*Mabille*); Gaboon, Cameroons (*Good*).

28. C. ILLUSTRIS, Mab.

Pardaleodes illustris, Mab. C. R. Soc. Ent. Belg. 1891, p. lxxiii.

Celænorrhinus illustris, Holl. Ent. News, March 1894, pl. iii. fig. 6.

Hab. Cameroons and Upper Valley of the Ogové.

29. C. MEDETRINA, Hew. (Plate III. fig. 2.)

Pterygospidea meditrina, Hew. Ann. & Mag. Nat. Hist. (4) vol. xx. p. 322 (1877).

Pardaleodes interniplaga, Mab. C. R. Soc. Ent. Belg. 1891, p. lxxiii.

Celænorrhinus interniplaga, Holland, Ent. News, March 1894, pl. iii. fig. 2.

Hab. Fernando Po (*Hewitson*); Cameroons (*Mabille*); Bulé Country (*Good*).

I am unable to discover any valid specific differences between *C. meditrina*, Hew., and *C. interniplaga*, Mab. I have a good series of specimens in my collection, some of which agree positively with either form, differing only in size and the greater or less distinctness of the marginal spots.

30. C. MACULATUS, Hampson. (Plate III. fig. 4.)

Coladenia maculata, Hpsn. Ann. & Mag. Nat. Hist. (6) vol. vii. p. 183.

Hab. Sabaki River, E. Africa (*Hampson*).

This species is a very near ally of *C. meditrina*, Hew. Two specimens, a male and a female, contained in the collection of Dr. Staudinger, were taken by Mocquerys at Gaboon. The female differs from the male in having the maculations of the secondaries greatly reduced in size. While these specimens do not agree absolutely with the type of *maculata*, Hpsn., they are by far too close to warrant a separation.

31. C. BISERIATUS, Butl. (Plate III. fig. 3.)

Plesioneura biseriata, Butl. P. Z. S. 1888, p. 97.

Plesioneura hoehneli, Rogenhofer, Ann. Hofmus. Wien, vol. vi. p. 463, pl. xv. fig. 10 (1891).

Hab. Kilimanjaro (*Butler*); Tropical Africa (*Rogenhofer*).

I think the above synonymy will be found to be quite correct.

32. C. ATRATUS, Mab.

Pardaleodes atratus, Mab. C. R. Soc. Ent. Belg. 1891, p. lxxiv.

Celænorrhinus collucens, Holl. Ent. News, March 1894, p. 90, pl. iii. figs. 3, 4.

Hab. Cameroons (*Mabille*; *Good*).

The type of *P. atratus* being before me as I write, I am convinced that I made an error in my identification of it upon the occasion of my visit to Mons. Mabille. The insect I labelled *atratus*, if there has been no confusion since made in the labelling of the specimens in the collection of Dr. Staudinger, is the following species, and the true *atratus* is the species I figured and named *collucens*. Dr. Staudinger warns me that Mons. Mabille has in a few cases apparently confused his types: this is one of those cases in which I am almost positive that such a confusion has arisen; but we must accept the type as determining controversy, and as the insect labelled autographically as *Pardaleodes atratus* by Mabille in the Staudinger Collection is unmistakably my

collucens, and not the next species in this series, we must regard the identification as positively settled in this way.

33. C. BOADICEA, Hew. (Plate III. fig. 1.)

Pterygospidea boadicea, Hew. Ann. & Mag. Nat. Hist. (4) vol. xx. p. 323 (1877).

Celænorrhinus atratus, Holl. Ent. News, March 1894, pl. iii. fig. 5.

Pardaleodes lucens, Mab., MS.

Hab. Gaboon, Cameroons.

Mons. Mabille, in the 'Comptes Rendus de la Société Entomologique de Belgique,' 1891, p. lxxiv, in his description of *Pardaleodes* (*Celænorrhinus*) *atratus*, alludes to a species of the genus named *lucens* by him from a figure of his type, which he has never published, so far as I am aware; I have been enabled to identify it with *boadicea*, Hew., which is undoubtedly the same insect figured by me in the 'Entomological News' for March 1894, as *C. atratus*, Mab. *C. boadicea*, Hew., may be distinguished from all other species by the greater breadth of the median yellow band on the primaries, and the larger expanse of the marginal spot near the outer angle of the secondaries on the upperside. This species is closely related to *C. atratus*, but quite distinct.

34. C. CHRYSOGLOSSA, Mab. (Plate III. fig. 5.)

Ancistrocampta chrysoglossa, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. cvii (1891).

Hab. Cameroons (*Mabille*; *Good*).

The type of the species is a female. The figure in the Plate is taken from a male specimen in my collection. The insect undoubtedly is a *Celænorrhinus*, but differs from the other African species in being more plainly marked upon the primaries.

35. C. PROXIMUS, Mab.

Plesioneura proxima, Mab. Bull. Soc. Zool. France, 1877, p. 231; Ann. Soc. Ent. France, (6) vol. x. p. 31, pl. iii. fig. 1.

Tagiades elmina, Ploetz, S. E. Z. vol. xl. p. 362 (1879).

Hab. Gaboon, Cameroons, Sierra Leone, Togoland.

36. C. MACROSTICTUS, Holl.

C. macrostictus, Holl. Ent. News, Jan. 1894, p. 27, pl. i. fig. 2.

Hab. Valley of the Ogové.

37. C. HUMBLOTI, Mab.

Plesioneura humbloti, Mab. Bull. Soc. Ent. Belg. 1884, p. clxxxvii; Grandidier's Madagascar, vol. xiii. p. 349, pl. 54. figs. 8, 8 *a*.

Hab. Madagascar.

38. C. (?) HOMEYERI, Ploetz.

Tagiades homeyeri, Ploetz, S. E. Z. vol. xli. p. 307 (1880).

Hab. Pundo Ndongo.

I do not know this species, but as it is said by the author to be very near *C. galenus*, Fabr., I locate it here provisionally.

39. C. MOKEEZI, Wallgr.

Pterygospidea mokeezi, Wallgr. K. Sv. Vet.-Acad. Handl. 1857; Lep. Rhop. Caffr. p. 54.

Hesperia amaponda, Trim. Trans. Ent. Soc. Lond. (3) vol. i. p. 405.

Nisoniades mokeezi, Trim. Rhop. Afr. Aust. vol. ii. p. 316, pl. vi. fig. 5.

Pteryyospidea mokeezi, Trim. Butt. S. Afr. vol. iii. p. 358.

Celænorrhinus mokeezi, Watson, P. Z. S. 1893, p. 50.

Hab. Extra-tropical S. Africa.

40. C. (?) LUEHDERI, Ploetz.

Plastingia luehderi, Ploetz, S. E. Z. vol. xl. p. 357 (1879), vol. xlv. p. 147 (1884).

Hab. Aburi (*Ploetz*).

The figure of this species drawn by Ploetz appears to be a crude representation of a species of *Celænorrhinus*, but the statement of Ploetz, that there is a sexual mark or brand upon the primaries, does not agree with this view. I am at a loss, without having the insect before me, to say where it should be located. Mons. Mabille's note upon the drawing of Ploetz, contained in one of his manuscript comments upon the Ploetzian figures, strikes me as very appropriate, "*mihi non verisimile videtur.*"

TRICHOSEMEIA[1], Holl.

41. T. SUBOLIVESCENS, Holl. (Plate V. fig. 15.)

T. subolivescens, Holl. Ann. & Mag. Nat. Hist. Oct. 1892, p. 294; Wats. P. Z. S. 1893, p. 53.

Hab. Matabeleland.

42. T. TETRASTIGMA, Mab.

Ceratrichia tetrastigma, Mab. C. R. Soc. Ent. Belg. 1891, p. lxv; Novit. Lepidopt. p. 119, pl. xvi. fig. 8.

Hab. Interior of Cameroons (*Staudinger*).

Mons. Mabille refers this species with some doubt to the genus *Ceratrichia*. With his type before me, I am able to assert that the species is positively congeneric with the type of the genus *Trichosemia*. It may even prove to be true that the two species are the same, in which case Mons. Mabille's name will have priority. There is, however, considerable difference in the colour

[1] By a typographical error, printed originally as "*Tricosemeia.*"

and markings of the underside of the secondaries, and it would not be at all safe to merge the two forms under the same name until we have more material.

43. T. QUATERNA, Mab.

Ceratrichia quaterna, Mab. C. R. Soc. Ent. France, 1889, p. clvi; Novit. Lepidopt. p. 20, pl. iii. fig. 3 (1891).

Hab. Sierra Leone (*Mabille*).

This beautiful species, the type of which is before me as I write, is correctly referred to the genus *Trichosemeia*.

44. T. (?) BRIGIDA, Ploetz.

Antigonus brigida, Ploetz, S. E. Z. vol. xl. p. 361 (1879).

Hab. Cameroons (*Good*); Roorke's Drift, S. Africa (*in my collection*).

What I take to be the species named *brigida* by Ploetz is a species which is more properly located in this genus than any other at present constituted, though the secondaries lack the characteristic hairy brand near the costa on the upperside, which led me to give the name which I have applied to this genus. This remark holds good also of the two following species.

45. T. (?) HEREUS, Druce. (Plate IV. fig. 21.)

Tagiades hereus, Druce, P. Z. S. 1875, p. 417.

Hab. Angola (*Monteiro*).

This species seems to be closely allied to, if not identical with, *S. brigida*, Ploetz. In case of identity the name given by Mr. Druce has priority.

46. T. (?) SUBALBIDA, Holl.

Sarangesa subalbida, Holl. Ent. News, Jan. 1894, p. 26, pl. i. fig. 7.

Hab. Valley of the Ogové (*Good*).

In the form of the wings and the neuration, together with the form of the antennæ, this species comes nearer those which are strictly classified in the genus *Trichosemeia* than to those included in *Sarangesa*. The hairy brand on the upperside of the secondaries is lacking; but in spite of this I prefer to place the species here, rather than to leave it where I originally located it.

TAGIADES, Hübn.

47. T. FLESUS, Fabr.

Papilio flesus, Fabr. Spec. Ins. ii. p. 135, no. 621 (1871); Mant. Ins. p. 88, no. 797 (1787); Ent. Syst. iii. p. 338, no. 286 (1793).

Nisoniades flesus, Butl. Cat. Fabr. Diurn. Lep. p. 286.

Papilio ophion, Dru. Ill. Exot. Ent. vol. iii. pl. xvii. figs. 1, 2 (1782); Stoll, Suppl. Cram. Pap. Exot. p. 127, pl. xxvi. figs. 4, 4 *c* (1791).

Nisoniades ophion, Trim. Rhop. Afr. Aust. vol. ii. p. 313 (1866).

Pterygospidea flesus, Trim. Butt. S. Afr. vol. iii. p. 363 (1889).
Tagiades flesus, Wats. P. Z. S. 1893, p. 54.
Hab. Africa, south of the Sahara.

48. T. INSULARIS, Mab.

T. insularis, Mab. Ann. Soc. Ent. France, 1876, p. 272; Grandidier's Madagascar, vol. xiii. p. 352 pl. 54. figs. 6, 7, 7*a*.
Thymele ophion, Boisd. Faune Entomol. Madgr. p. 62, pl. ix. fig. 4 (1833).
Hab. Madagascar.
This is the insular form of *T. flesus*, Fabr., which is found in Madagascar, and can scarcely be separated from the Fabrician species.

49. T. LACTEUS, Mab.

Tagiades lacteus, Mab. Bull. Soc. Ent. France, (5) vol. vii. p. xxxix.
Tagiades dannatti, Ehrmann, Ent. News, vol. iv. p. 309; Holl. Ent. News, March 1894, pl. iii. fig. 1.
Hab. Congo, Liberia.
My surmise that *T. lacteus* and *T. dannatti* are identical, which I expressed in my paper of March 1894, has been confirmed by Mons. Mabille, who has compared my figure with the type.

50. T. SAMBORANA, H. G. Smith.

Tagiades samborana, H. Grose Smith, Ann. & Mag. Nat. Hist. (6) vol. vii. p. 127.
Hab. Madagascar.
I do not know this species.

51. T. SMITHII, Mab.

Tagiades smithii, Mab. Grandidier's Madagascar, vol. xiii. p. 354, pl. 56 A. figs. 3, 3*a*.
Hab. Madagascar.
The plate on which this species is to be figured has not yet been published. I do not know the species in nature, nor by any pictorial representation.

EAGRIS, Guen.

52. E. SABADIUS, Gray.

Hesperia sabadius, Gray, Griff. An. Kingd. vol. xv. pl. 99. fig. 2 (1832).
Thymele sabadius, Boisd. Faun. Entom. Madgr. p. 63, pl. ix. fig. 2 (1833).
Eagris sabadius, Guen. Maill. Réun. vol. ii. Lép. p. 18 (1863); Mab. Grandid. Madagr. vol. xiii. p. 350, pl. 54. figs. 4, 4*a*, 5.
Hesperia andrachne, Boisd. Faun. Ent. Madgr. p. 67 (1833); Guérin, Iconogr. Règne Anim., Ins. pl. lxxxii. fig. 2 (1844).
Antigonus andrachne, Saalm. Lep. Madgr. p. 112, pl. i. fig. 14.

Plesioneura hyalinata, Saalm. Ber. Senck. Ges. 1877–78, p. 87.
Plesioneura andrachne (Boisd.), Saalm. Ber. Senck. Ges. 1878–79, p. 123.
Hab. Madagascar.

53. E. NOTTOANA, Wallgr.

Pterygospidea nottoana, Wallgr. K. Sv. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 54.
Nisoniades sabadius, Trim. Rhop. Afr. Austr. vol. ii. p. 315.
Pterygospidea nottoana, Trim. S. Afr. Butt. vol. iii. p. 360.
Eagris melancholica, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. clv.
Eagris nottoana, Wats. P. Z. S. 1893, p. 54.
Hab. South Africa.
The comparison of the type of *E. melancholica*, Mab., shows it to be identical with *E. nottoana*, as determined by Mr. Trimen.

54. E. DECASTIGMA, Mab.

Eagris decastigma, Mab. C. R. Soc. Ent. Belg. 1891, p. lxii; Novit. Lepidopt. p. 118, pl. xvi. fig. 7; Holl. Ent. News, Jan. 1894, pl. i. fig. 9.
Hab. Sierra Leone, Gaboon.

55. E. FUSCOSA, Holl. (Plate V. fig. 4.)

Eagris fuscosa, Holl. Ent. News, Jan. 1894, p. 27, pl. i. fig. 6.
Hab. Valley of the Ogové (*Good*); Gaboon (*Mocquerys*).
This is a somewhat close ally of *E. phyllophila*, Trim., but may be readily distinguished from that species by the form of the large spots on the disk of the primaries.

56. E. PHYLLOPHILA, Trim.

Nisoniades phyllophila, Trim. Trans. Ent. Soc. Lond. 1883, p. 362.
Pterygospidea phyllophila, Trim. S. Afr. Butt. vol. iii. p. 362, pl. xii. fig. 8.
Hab. Natal, Delagoa Bay (*Trimen*).

57. E. JAMESONI, Sharpe.

Antigonus jamesoni, Sharpe, Ann. & Mag. Nat. Hist. (6) vol. vi. p. 348 (1890).
Pterygospidea jamesoni, Trim. P. Z. S. 1891, p. 106, pl. ix. fig. 25.
Caprona jamesoni, Butl. P. Z. S. 1893, p. 669.
Hab. S.W. Africa, Mashonaland.

58. E. DENUBA, Ploetz. (Plate V. fig. 8.)

Antigonus denuba, Ploetz, S. E. Z. vol. xl. p. 361 (1869).
Eagris decolor, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. clv (1889); Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 262 (1893).

Hab. Aburi (*Ploetz*); Freetown (*Mabille*); Cameroons (*Good*); Togoland (*Karsch*).

Having before me a drawing of the type of Ploetz, executed by Prillwitz, which is reproduced in the Plate, and the type of Mabille, loaned me by Dr. Staudinger, I am positively satisfied as to the identity of the two.

59. E. LUCETIA, Hew.

Leucochitonea lucetia, Hew. Ill. Exot. Butt. vol. v. Hesp., *Leucochitonea*, pl. ii. fig. 21.

Hab. Angola (*Hewitson*).

PROCAMPTA, Holl.

60. P. RARA, Holl.

Procampta rara, Holl. Ann. & Mag. Nat. Hist. Oct. 1892, p. 293; Watson, P. Z. S. 1893, p. 59; Holl. Ent. News, Mar. 1894, pl. iii. fig. 7.

Hab. Valley of the Ogové.

CAPRONA, Wallgr.

61. C. PILLAANA, Wallgr.

Caprona pillaana, Wallgr. K. Sv. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 51; Trim. Rhop. Afr. Austr. vol. ii. p. 308 (1866); S. Afr. Butt. vol. iii. p. 348, pl. xii. figs. 6, 6 *a* (1889).

Stethotrix heterogyna, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. clxxxiv (1889).

Caprona adelica, Karsch, Ent. Nachr. vol. xviii. p. 242 (1892); Berl. Ent. Zeit. vol. xxxviii. p. 243, pl. vi. fig. 2 (1893).

Hab. South Africa, Natal, Loko, Togoland.

Mons. Mabille writes me that the species of Karsch is absolutely identical with his *S. heterogyna*, in which opinion, with the type before me as I write, I am able to positively concur. But the male of *S. heterogyna* is most certainly identical with *C. pillaana*, Wallgr. I am not alone in this opinion. Dr. Staudinger writes me that Prof. Aurivillius has most unqualifiedly given in his adhesion to this view on examination of specimens submitted to him. The female, the type of which is before me, might have served the artist for the drawing of *C. adelica* given by Dr. Karsch, and differs from the rather crude figure of the female of *C. pillaana*, Wallgr., given by Trimen in being paler, and having a sharply defined black spot on the underside of the secondaries near the inner margin. With only the female sex before me I might have hesitated a little to make the above synonymy, but the identity of the male with *C. pillaana* being so positively certain, I do not doubt the correctness of what I have given above.

62. C. CANOPUS, Trim.

Caprona canopus, Trim. Trans. Ent. Soc. Lond. (3) vol. ii. p. 180

(1864); Rhop. Afr. Austr. vol. ii. p. 309, pl. vi. fig. 2 (1866); Staud. Exot. Schmett. pl. 100; Trim. S. Afr. Butt. p. 349 (1889).

Hab. Extra-tropical South Africa.

Abantis, Hopff.

(*Leucochitonea*, Wallgr.; *Sapœa*, Ploetz.)

I cannot bring myself to differ from Trimen, and to accept the conclusion of Watson, that *L. levubu*, Wallgr., should constitute the type and sole representative of a genus. The difference between this species and the others given below are certainly rather of specific than of generic grade. I therefore sink Wallengren's genus *Leucochitonea* as a synonym of *Abantis*, Hopff., as has already been done by Trimen.

63. A. tettensis, Hopff.

Abantis tettensis, Hopff. Monatsb. k. Akad. Wiss. Berl. 1855, p. 643; Peters' Reise Mossamb., Ins. p. 415, pl. xxvi. figs. 16, 17 (1862); Trim. S. Afr. Butt. vol. iii. p. 337 (1889); Wats. P. Z. S. 1893, p. 63.

Hab. South Tropical and Temperate Africa.

64. A. paradisea, Butl.

Leucochitonea paradisea, Butl. Trans. Ent. Soc. Lond. 1870, p. 499; Lep. Exot. p. 167, pl. lix. fig. 8 (1874).

Hesperia (*Oxynetra*) *namaquana*, Westw. Thes. Ent. Oxon. p. 183, pl. xxxiv. fig. 10 (1874).

Leucochitonea paradisea, Staudgr. Exot. Schmett. i. pl. 100.

Abantis paradisea, Trim. S. Afr. Butt. p. 342 (1889); Wats. P. Z. S. 1893, p. 63.

Hab. Southern Africa.

65. A. zambesiaca, Westw.

Hesperia zambesiaca, Westw. Thes. Ent. Oxon. p. 183, pl. xxxiv. fig. 9 (1874).

Abantis zambesina, Trim. S. Afr. Butt. vol. iii. p. 344 (1889); P. Z. S. 1891, p. 105.

Sapœa trimeni, Butl. P. Z. S. 1895, p. 264, pl. xv. fig. 5.

Hab. Southern Tropical Africa.

With the figures of their species, given by Westwood and Butler, before me and a long series of specimens labelled by Mr. Trimen to compare with them, I am wholly at a loss to see what valid reason exists for separating the insect recognized by Dr. Butler as *Sapœa trimeni* from the insect described by Westwood. It is true that the normal colour of the sides of the abdominal segments of the insect is "snow-white," as stated by Dr. Butler, and brought out in his excellent figure, but the fact that Westwood says that these segments in the type were 'luteous" does not in my judgment furnish sufficient reason to

say that we are dealing here with two distinct species. "Luteous" is muddy yellow, and nothing is commoner among the Hesperiidæ than the change of the white markings of the abdomen into yellowish by greasing and other accidents. I am reluctant to differ from my learned friend Dr. Butler on any point, but after studying the specimens before me with the figures and descriptions given by himself and Westwood, I am still of the opinion that Mr. Trimen's original identification was correct, and that the separation of the form known to Trimen from that described by Westwood is an unnecessary refinement.

66. A. BISMARKI, Karsch.

Abantis bismarki, Karsch, Ent. Nachr. xviii. p. 228 (1892); Berl. Ent. Zeit. vol. xxxviii. p. 242, pl. vi. fig. 1 (1893).

Hab. Togoland.

67. A. BICOLOR, Trim.

Leucochitonea bicolor, Trim. Trans. Ent. Soc. Lond. (3) vol. ii. p. 180 (1864); Rhop. Afr. Austr. vol. ii. p. 307, pl. 6. fig. 1 (1866).

Sapœa bicolor, Ploetz, S. E. Z. vol. xl. pp. 177, 179 (1879).

Abantis bicolor, Trim. S. Afr. Butt. vol. iii. p. 340 (1889); Wats. P. Z. S. 1893, p. 63.

Hab. S. Africa.

68. A. VENOSA, Trim.

Abantis venosa, Trim. S. Afr. Butt. vol. iii. p. 339 (1889); P. Z. S. 1891, p. 105, pl. ix. fig. 24.

Leucochitonea umvulensis, Sharpe, Ann. & Mag. Nat. Hist. (6) vol. vi. p. 348 (1890).

Hab. South Tropical Africa and Transvaal.

69. A. ELEGANTULA, Mab.

Abantis elegantula, Mab. Ann. Soc. Ent. France, 1890, p. 32; Novit. Lepidopt. p. 23, pl. iii. fig. 6 (1891).

Hab. Sierra Leone.

70. A. EFULENSIS, sp. nov. (Plate V. fig. 12.)

♂. Allied to *A. elegantula*, Mab., from which it differs by the entire absence of the discal spots on the primaries. The secondaries are white, with the basal third, the outer angle, and the inner margin clouded with dark brown, shading on the costa into orange-red. The white outer area is intersected by the veins, which are black.

On the underside, the primaries are much paler than on the upperside and are slightly tinged near the base and on the costa with ochreous. The secondaries are pure white, except on the costal margin and the outer angle, where they are laved with pale brown shading into ochraceous. The veins on the underside are not black

as on the upperside, except those which are located near the costa. The body is marked much as in *A. elegantula*, but is without the red spots at the end of the patagia and the red hairs which are found on the metathorax. Expanse 40 mm.

Hab. Efulen, Cameroons.

71. A. LEUCOGASTER, Mab.

Abantis leucogaster, Mab. Ann. Soc. Ent. France, 1890, p. 32; Novit. Lepidopt. p. 22, pl. iii. fig. 5 (1891).

Hab. Sierra Leone.

72. A. LEVUBU, Wallgr.

Leucochitonea levubu, Wallgr. K. Sv. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 52; Trim. Rhop. Afr. Austr. vol. ii. p. 306.

Abantis levubu, Trim. S. Afr. Butt. vol. iii. p. 345, pl. xii. fig. 5.

Hab. Southern Africa.

HESPERIA, Fabr.

(*Pyrgus*, Hübn.; *Scelothrix*, Ramb.; *Syrichtus*, Boisd.)

73. H. SPIO, Linn.

Papilio spio, Linn. Syst. Nat. ed. xii. p. 796, no. 271 (1767); Fabr. Syst. Ent. p. 535, no. 400 (1775); Donovan, Ins. Ind. pl. i. fig. 5 (1800–3).

Hesperia spio, Fabr. Ent. Syst. iii. 1, p. 354, no. 348 (1783); Westw., Don. Ins. Ind. 2nd edit. p. 79, pl. 50. fig. 5 (1842); Aurivillius, K. Sv. Vet.-Akad. Handl. vol. xix. no. 5, p. 124, tab. i. figs. 3, 3*a*, after Clerck (1882).

Papilio vindex, Cram. Pap. Exot. vol. iv. pl. cccliii. figs. G, H (1782); Watson, P. Z. S. 1893, p. 65.

Pyrgus vindex, Hübn. Verz. p. 109, no. 1178 (1816); Hopff. Peters' Reise Mossamb., Ins. p. 421 (1862); Trim. Rhop. Afr. Austr. vol. ii. p. 287 (1866); S. Afr. Butt. vol. iii. p. 280 (1889).

Hesperia vindex, Latr. Enc. Méth. vol. ix. p. 785 (1823); Westw., Doubl. & Hew. Gen. Diurn. Lep. pl. lxxix. fig. 6 (1852).

Syrichtus vindex, Wallgr. Rhop. Caffr. p. 53 (1857).

Hab. Southern Africa.

I had long been led to question whether this species had been found in the western tropical parts of Africa. I have never received it from Gaboon, Cameroons, Sierra Leone, or Liberia, though I have charged my collectors to make special search for the Hesperiidæ, and have received thousands of specimens from them. The species identified for me as *H. spio*, L. (*vindex*, Cram.), by several European authorities, is very different from the S.-African insect, of which I have numerous examples received from Mr. Trimen and others. It is *H. ploetzi*, Auriv. My doubt as to the existence of the species on the Tropical West Coast has been, however, put to rest by the discovery of a specimen from Monrovia in the collection of Dr. Staudinger.

74. H. DROMUS, Ploetz.

Pyrgus dromus, Ploetz, Mitth. nat. Ver. Neu-Vorpomm. u. Rüg. 1884, p. 6; Trim. S. Afr. Butt. vol. iii. p. 283 (1889).

Hesperia dromus, Watson, P. Z. S. 1893, p. 65.

Hab. South Africa (? North of the Congo).

This species is generally confounded in collections with the preceding, but by attending to the differences so clearly pointed out by Mr. Trimen they may easily be separated. Ploetz states that his type was from the Congo, and Mr. Trimen, upon the authority of G. Geynet, gives the "Gaboon River" as a habitat. I am inclined to question the correctness of the reference of this species to these localities. I may be in error, but am inclined to think that it does not range further north than Angola on the West Coast.

75. H. PLOETZI, Auriv.

Syrichtus spio, Ploetz, Mitth. nat. Ver. Neu-Vorpomm. u. Rüg. 1884, p. 21.

Pyrgus spio, Mab. Ann. Soc. Ent. France, (6) vol. x. p. 30, pl. iii. fig. 9 (1890).

Hesperia ploetzi, Auriv. Ent. Tidsk. 1891, p. 227.

Pyrgus ploetzi, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 245 (1893).

Hab. Gaboon, Liberia, Sierra Leone, Togoland.

76. H. SATASPES, Trim.

Pyrgus sataspes, Trim. Trans. Ent. Soc. Lond. (3) vol. ii. p. 178 (1864); Rhop. Afr. Austr. vol. ii. p. 290, pl. v. fig. 7 (1866); S. Afr. Butt. vol. iii. p. 289 (1889).

Hab. South Africa.

77. H. DIOMUS, Hopff.

Pyrgus diomus, Hopff. Monatsber. k. Akad. Wissensch. Berl. 1855, p. 643; Peters' Reise n. Mossamb., Ins. p. 420, pl. xxvii. figs. 9, 10 (1862).

Hab. Tropical East Africa.

78. H. FEROX, Wallgr.

Syrichthus ferox, Wallgr. Wien. Ent. Monatschr. 1863, p. 137.

Pyrgus vindex, Cram.? var., Trim. Rhop. Afr. Austr. vol. ii. pp. 287–288 (1866).

Hesperia (*Syrichthus*) *diomus*, Wallgr. Sv. Vet.-Akad. Förh 1872, p. 50.

Pyrgus diomus, Möschl. Verh. zool.-bot. Ges. Wien, 1883, p. 286.

Hesperia sandaster, Staudgr. Exot. Schmett. vol. ii. pl. 100 (1888).

Pyrgus diomus, Trim. S. Afr. Butt. vol. iii. p. 287 (1889).

Hesperia diomus, Wats. P. Z. S. 1893, p. 65.

Hab. Southern Africa.

"I have come to the conclusion that *Pyrgus diomus*, Hopff., is really distinct from *P. ferox*, Wallgr., although Wallengren himself in 1872 sank the latter in favour of the former. None of the South-African specimens that I have seen agrees with Hopffer's description and figures in the important point of the white bands on the underside of the hind wings, which markings are always much more oblique in the southern examples. The other day I received a pair from Zanzibar, which exactly agree with Hopffer's figures. So I think we may call the abundant southern form *P. ferox*. By the way, what Dr. Staudinger figures as my *P. sandaster* is apparently *P. ferox*." (R. Trimen, *in literis*, 1894.)

79. H. ASTERODIA, Trim.

Pyrgus asterodia, Trim. Trans. Ent. Soc. Lond. (3) vol. ii. p. 178 (1864); Rhop. Afr. Austr. vol. ii. p. 289, pl. v. fig. 6 (1866); S. Afr. Butt. vol. iii. p. 284 (1889).

Hesperia asterodia, Watson, P. Z. S. 1893, p. 65.

Syrichthus asterodia, Ploetz, Mitth. nat. Ver. Neu-Vorpomm. u. Rüg. 1884, p. 21.

Hab. South Africa.

80. H. TRANSVAALIÆ, Trim.

Pyrgus transvaaliæ, Trim. S. Afr. Butt. vol. iii. p. 286 (1889).

Hab. South Africa.

Allied, according to the author, to *H. spio*, Linn. (*vindex*, Cram.), and *dromus*, Ploetz.

81. H. AGYLLA, Trim.

Pyrgus agylla, Trim. S. Afr. Butt. vol. iii. p. 286 (1889).

Hab. South Africa.

This species is unknown to me except by the description of Mr. Trimen.

82. H. MAFA, Trim.

Pyrgus mafa, Trim. Trans. Ent. Soc. Lond. 1870, p. 386, pl. vi. fig. 12; S. Afr. Butt. vol. iii. p. 284.

Hab. South Africa.

Doubtfully distinct from *H. spio*, Linn.

83. H. SANDASTER, Trim.

Pyrgus sandaster, Trim. Trans. Ent. Soc. Lond. 1868, p. 92, pl. v. fig. 9; S. Afr. Butt. vol. iii. p. 291 (1889).

Hab. South Africa.

84. H. NANUS, Trim.

Pyrgus sataspes, var. A. Trim. Rhop. Afr. Austr. vol. ii. p. 290 (1866).

Pyrgus nanus, Trim. S. Afr. Butt. vol. iii. p. 290 (1889).

Hab. South Africa.

85. H. SECESSUS, Trim.

Pyrgus secessus, Trim. P. Z. S. 1891, p. 102, pl. ix. fig. 22.

Hab. South-western Africa.

86. H. COLOTES, Druce. (Plate I. fig. 11.)

Pyrgus colotes, Druce, P. Z. S. 1875, p. 416.

Hab. Angola (*Monteiro*).

87. H. NORA, Ploetz.

Pyrgus nora, Ploetz, Mitth. nat. Ver. Neu-Vorpomm. u. Rüg. 1884, p. 7.

Hab. Loango (*Ploetz*).

This species is unknown to me, and may be identical with some other species. The description is very unsatisfactory. In some respects it applies to *H. secessus*, Trim.

88. H. ZAIRA, Ploetz.

Pyrgus zaira, Ploetz, Mitth. nat. Ver. Neu-Vorpomm. u. Rüg. 1884, p. 6.

Hab. Congo (*Ploetz*).

This species is only known to me by the brief and unsatisfactory description of Ploetz.

89. H. ABSCONDITA, Ploetz.

Syrichthus abscondita, Ploetz, Mitth. nat. Ver. Neu-Vorpomm. u. Rüg. 1884, p. 21.

Hab. Africa (*Ploetz*).

The description is too slight to base any conjecture upon it as to what the author intended thereby.

90. H. PROTO, Esp.

Papilio proto, Esp. Eur. Schmett. i. 2, pl. 123. figs. 5, 6 (1806 ?).

For synonymy *cf.* Staudinger and Wocke, Kirby, Syn. Catalogue, &c.

Hab. Morocco.

91. H. ALI, Oberth.

Syrichthus ali, Oberth. Étud. Entom. vi. 3, p. 61, pl. ii. fig. 3 (1881).

Hab. Algeria.

92. H. LEUZEÆ, Oberth.

Syrichthus leuzeæ, Oberth. Étud. Entom. vi. 3, p. 60, pl. iii. fig. 10 (1881).

Hab. Algeria.

93. H. ALVEUS, Hübn., var. ONOPORDI, Ramb.

Syrichthus onopordi, Ramb. Faun. And. pl. viii. fig. 13 (1839).

For fuller synonymy *cf.* standard works on the Lepidoptera of the palæarctic faunal region.

Hab. North Africa.

94. H. (?) OILEUS, Linn.

Papilio oileus, Linn. Syst. Nat. i. 2, p. 795, no. 269 (1767).

Hesperia oileus, Kirby, Syn. Cat. p. 615 (1871).

Hab. Algeria (*Kirby*).

This is a doubtful species, and it does not appear that any one has been able to discover exactly what Linnæus intended to designate by his name and description. *Nominis umbra* ! !

CARCHARODUS, Hübn.

(*Urbanus*, Hübn.; *Spilothyrus*, Dup.)

95. C. ALCEÆ, Esp.

Papilio alceæ, Eur. Schmett. i. 2, pl. li. fig. 3 (1780).

For further synonymy see standard works on the Lepidoptera of the palæarctic faunal region.

Hab. North Africa.

96. C. ELMA, Trim.

Pyrgus elma, Trim. Trans. Ent. Soc. Lond. (3) vol. i. p. 288 (1862); Rhop. Afr. Austr. vol. ii. p. 291, pl. v. fig. 8 (1866); S. Afr. Butt. vol. iii. p. 293.

Gomalia elma, Watson, P. Z. S. 1893, p. 67.

Pyrgus elma, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 245, pl. vi. fig. 12.

Hab. Southern Africa.

I place this insect in the genus *Carcharodus*, Hübn., rather than in the genus *Gomalia*, Moore, to which it has been assigned by Mr. Watson, because the differences of a structural character which separate it from its near allies, *C. alceæ* and *C. lavateræ*, are, in my opinion, too slight to warrant the subdivision. In fact, I call in question the propriety of retaining the name *Gomalia* as a generic designation, it being founded upon differences which appear to me to be rather specific than generic. I am quite persuaded that *Gomalia albofasciata*, Moore, the type of his genus, belongs to the older genus of Hübner, and I think *Gomalia* should be sunk as a synonym of *Carcharodus*.

The figure given by Karsch is by no means characteristic. The checkered character of the fringes is not made to appear, and were not the identification made by Karsch so positive, I should think we were dealing with some other species, belonging, perhaps, to a different genus.

97. C. (?) MIDEA, Walk.

Pelopidas midea, Walk. Entomologist, vol. v. p. 56 (1870).
Erynnis? midea, Kirby, Syn. Cat. p. 830 (1877).
Hab. Cairo.

I know nothing of this species. Mr. Kirby's reference to *Erynnis* leads me to place it here. Mr. Butler could not find the type in the British Museum. I fear that in this, as in so many other cases, we shall never be able to know exactly what Mr. Walker intended by his specific appellation.

Subfam. PAMPHILINÆ.

TRAPEZITES, Hübn.

The following species, all but one occurring in Madagascar, I allow to remain in the genus *Trapezites*, where they have been for the most part located by Dr. Butler and Mons. Mabille. Lieut. Watson states that the genus *Trapezites*, in the strict sense, is confined to the Australian region. Unfortunately I have not sufficient material at hand to justify the attempt by dissection and bleaching to determine whether these species are really separable from the genus in which they have hitherto been placed. It is much to be wished that some capable collector, who has an eye for the more obscure forms, might soon visit and thoroughly explore the field which is awaiting his labour in the great island east of Africa.

98. T. EMPYREUS, Mab.

Cyclopides empyreus, Mab. Pet. Nouv. Entom. vol. ii. p. 285 (1878).
Trapezites empyreus, Mab. Grand. Madgr. vol. xviii. p. 336, pl. liii. figs. 1, 1 *a*, 2 (1887).
Hab. Madagascar.

99. T. FASTUOSUS, Mab.

Cyclopides empyreus (pro parte), Mab. Pet. Nouv. Entom. vol. ii. p. 285 (1878).
Trapezites fastuosus, Mab. C. R. Soc. Ent. Belg. vol. xxviii. p. clxxxvi (1884); Grandid. Madgr. vol. xviii. p. 338, pl. liii. figs. 9, 9 *a* (1887).
Hab. Madagascar.

100. T. CARMIDES, Hew.

Cyclopides carmides, Hew. Descript. One Hundred New Hesperid. p. 41 (1868); Exot. Butt. vol. v. pl. *Cyclopides*, fig. 1 (1874).
Trapezites carmides, Mab. Grandid. Madgr. vol. xviii. p. 332, pl. liii. figs. 3, 3 *a* (1887).
Hab. Madagascar.

101. T. MALCHUS, Mab.

Cyclopides malchus, Mab. Bull. de la Soc. Philomat. p. 136 (1877).

Hesperia ypsilon, Saalm. Lep. Madgr. p. 110 (1884).

Trapezites malchus, Mab. Grandid. Madgr. vol. xviii. p. 332, pl. liii. figs. 5, 6 (1887).

Hab. Madagascar.

102. T. GILLIAS, Mab.

Pamphila gillias, Mab. Pet. Nouv. Entom. vol. ii. p. 285 (1878).

Trapezites kingdoni, Butl. Ann. & Mag. N. H. (5) vol. iv. p. 232 (1879).

Trapezites gillias, Mab. Grandid. Madgr. vol. xviii. p. 335, pl. liii. figs. 8, 8*a* (1887).

Hab. Madagascar.

103. T. HOVA, Mab.

Cyclopides hova (err.), Mab. Bull. Soc. Ent. France, (5) vol. v. p. ccxv (1875).

Trapezites hova, Mab. Grandid. Madgr. vol. xviii. p. 335, pl. liii. figs. 7, 7*a* (1887).

Hab. Madagascar.

104. T. CATOCALINUS, Mab.

Cyclopides catocalinus, Mab. Pet. Nouv. Entom. vol. ii. p. 285 (1878).

Trapezites catocalinus, Mab. Grandid. Madgr. vol. xviii. p. 339, pl. liii. figs. 4, 4*a* (1887).

Hab. Madagascar. (Erroneously? labelled in Dr. Staudinger's collection as from the Gold Coast.)

105. T. PAROECHUS, Mab.

Trapezites paroechus, Mab. Grandid. Madgr. vol. xviii. p. 334, pl. lii. figs. 1, 2, 2*a* (1887).

Hab. Madagascar.

106. T. (?) CHIRALA, Trim.

Pamphila chirala, Trim. P. Z. S. 1894, p. 76, pl. vi. fig. 18, ♀.

I place this species here provisionally, as, both from the figure and the description, it seems more nearly allied to the species in this group than to any others.

ACLEROS, Mab.

107. A. LEUCOPYGA, Mab.

Cyclopides leucopyga, Mab. Bull. Soc. Ent. France, 1877, p. 101.

Acleros leucopyga, Mab. Grandid. Madgr. vol. xiii. p. 347, pl. liv. figs. 3, 3 *a* (1887); Watson, P. Z. S. 1893, p. 76.

Hab. Madagascar.

This species may be distinguished from *A. ploetzi*, its near ally, by the broader extent of the white markings upon the outer margin of the secondaries, and the paler, more irregularly clouded underside of the secondaries. There are two specimens in the collection of Dr. Staudinger labelled as taken at Gaboon by Mocquerys, which are almost identical with examples from Madagascar. They were taken in September. (Are the locality-labels correct in these cases?)

108. A. PLOETZI, Mab. (Plate II. fig. 7.)

Apaustus leucopygus, Ploetz, S. E. Z. vol. xl. p. 360 (1879).

Acleros ploetzi, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. clxviii (1889).

Hab. Aburi, Victoria, W. Africa (*Ploetz*); Gaboon, Cameroons (*Good*).

Mons. Mabille has very properly suggested the name *ploetzi* for this species, in view of the fact that the specific name *leucopyga* had already, in 1877, been applied by him to a closely allied species from Madagascar.

109. A. MACKENII, Trim.

Pamphi'a ? *mackenii*, Trim. Trans. Ent. Soc. Lond. 1868, p. 95, pl. vi. fig. 3.

Ancyloxypha mackenii, Trim. S. Afr. Butt. vol. iii. p. 331 (1889).

Hab. Southern Africa.

This species is very closely allied to *A. ploetzi*, Mab. (*leucopygus*, Ploetz), but may be distinguished by its somewhat larger size, and by the fact that the underside of the primaries is much darker, and by the two subtriangular spots of white standing out boldly upon this dark ground near the inner margin.

110. A. PLACIDUS, Ploetz. (Plate II. fig. 19.)

Apaustus placidus, Ploetz, S. E. Z. vol. xl. p. 360 (1879), vol. xlv. p. 157 (1884).

Hab. Aburi (*Ploetz*).

The figure of the type given in the plate accompanying this article suggests that the original specimen is somewhat faded. I am greatly inclined to the view that it represents a somewhat rubbed specimen of the species since named *A. biguttulus* by Mons. Mabille, and which may also be identical with the species named *A. substrigata* by me. In a very long series of specimens, numbering nearly one hundred, I find specimens more or less worn, which agree well with the figure and description of *placidus*, and others which are undoubtedly very close to, if not identical with, *biguttulus*, and still others, bright and fresh, which are

unmistakably separated from the others by the markings of the underside of the secondaries as represented in the photographic representation of *substrigata* given by me in the 'Entomological News' for January, 1894. Whether all of these belong to one and the same species remains to be proved, but the presumption seems to me to be in favour of this view. I do not, however, sink Mabille's species and my own as synonyms of *placidus* in the present paper, although inclined strongly to take this view.

111. A. BIGUTTULUS, Mab.

Acleros biguttulus, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. clxvii (1889).

Hab. Freetown, W. Africa (*Mabille*).

From the brief description of the species given by Mons. Mabille, this species appears to me to be very near *A. placidus*, Ploetz (*q. v.*).

112. A. SUBSTRIGATA, Holl.

Acleros substrigata, Holl. Ent. News, Jan. 1894, p. 28, pl. i. figs. 10, 11.

Hab. Valley of the Ogové.

This is possibly a form of *placidus*, Ploetz, as I have intimated above.

113. A. OLAUS, Ploetz.

Apaustus olaus, Ploetz, S. E. Z. vol. xlv. p. 156 (1884); Karsch, Berl. Ent. Zeit. 1893, p. 260.

Hab. Loango (*Ploetz*), Togoland (*Karsch*).

Ploetz in his catalogue of the species of *Apaustus*, given in the Stett. Ent. Zeit. 1884, places *A. olaus* immediately before his *leucopyga*, which is strictly congeneric with the species described under the same name by Mabille, and made the type of the genus *Acleros*. A good copy of Ploetz's drawing, pl. 744, shows that in form and pattern of marking *olaus* is indeed very near to *leucopyga*, Ploetz (*ploetzi*, Mabille); the main difference being the spots in the primaries noted by Ploetz in his original description. An examination of the figure of Ploetz makes it plain, furthermore, that the type was a female. It seems do me quite possible that the insect described was a female of the species previously described by Trimen as *Pamphila* (?) *mackenii*. Karsch apparently is not sure of his identification of this species as given in his article in the Berl. Ent. Zeit. quoted in the synonymy above.

114. A. INSTABILIS, Mab.

Acleros instabilis, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. clxviii (1889).

Hab. Zanzibar (*Mabille*).

There are two females in the collection of Dr. Staudinger,

which are labelled as from Loko, which are plainly referable to this species, which is doubtfully distinct from *A. ploetzi*, Mab. (*leucopygus*, Ploetz). The specimens are smaller in size than is usual in the case of the female of *A. ploetzi*, Mab., and the outer angle of the primaries on the lower side is lighter. The white spots on intervals two and three in the primaries are very large and distinct, more so than in females of *A. ploetzi*, observed by me. Still this may be only a local variety of *A. ploetzi*.

GORGYRA, gen. nov.

Antennæ long, slender; club small, gradually thickened, tapering to a fine point; terminal portion bent, but not hooked. Palpi: first joint short; second joint long, profusely clothed with hair, erect, and rising almost or quite to the vertex; third joint long, subconical, porrect, clothed with fine closely appressed hairs. Fore wing: inner margin a little longer than the outer margin; cell about one-half the length of the costa; vein 12 reaching the costa before the end of the cell, veins 7 and 8 from before the end of the cell; the upper and middle discocellulars form an obtuse angle at the end of the cell pointing inwardly, the middle and lower discocellulars form an angle with the apex pointing out-

Head and neuration of *Gorgyra aburæ*, Ploetz, ♂. ½.

wardly; vein 5 is nearer vein 4 than 6; vein 3 well before the end of the cell; vein 2 twice as far from the end of the cell as from the base of the wing. Hind wing: the outer margin is evenly rounded and slightly excavated before vein 1 *b*; cell not quite reaching the middle of the wing; vein 7 well before the end of the cell, twice as far from 8 as from 6; discocellulars faint, nearly erect; vein 5 wanting or but faintly indicated; vein 3 just before the end of the cell; vein 2 beyond the middle of the cell; veins 1 *a* and 1 *b* curved; vein 1 *b* clothed on either side with a bundle

of long hair-like scales; hind tibiæ almost naked and with two pairs of spurs.

Type *G. aburæ*, Ploetz.

115. G. ABURÆ, Ploetz.

Apaustus aburæ, Ploetz, S. E. Z. vol. xl. p. 359 (1879), vol. xlv. p. 153 (1884).

Hab. Tropical West Africa.

G. DIVERSATA, var. nov.

This form differs from typical *G. aburæ*, Ploetz, in being prevalently lighter in colour on the underside of the primaries and the disc of the secondaries, the darker outer third of the secondaries remaining as in the typical form, and giving the appearance, therefore, of a dark diffuse hind marginal border to the wing.

This form is quite common. About one-half of the specimens collected for me in the Valley of the Ogové belong to it, but I cannot lead myself to believe that it represents a species. Save in the colour modification noted, the specimens otherwise agree absolutely with *G. aburæ*, and there are a number of intergrading forms. (*See next species.*)

116. G. HETEROCHRUS, Mab.

Pamphila heterochrus, Mab. Ann. Soc. Ent. France, (6) vol. x. p. 31, pl. iii. fig. 7 (1890); Novit. Lepidopt. p. 116, pl. xvi. fig. 4 (1893).

Gastrochæta diversata, Mab. MS., in coll. Staudinger.

Hab. Tropical West Africa.

The figure of *G. heterochrus* in the 'Novitates,' was drawn from a specimen in the Staudinger collection, which has been labelled *Gastrochæta diversata* by Mons. Mabille. Another specimen which does not at all agree with the figure in the 'Novitates,' and the duplicate of which was pronounced by Mons. Mabille himself to be a hitherto undescribed species, is labelled in the Staudinger collection as the type of *G. heterochrus*. There has plainly been a misplacement of the labels. I have therefore taken the liberty of applying the name proposed by Mons. Mabille to this new form, of which there are numerous examples in my collection, and which is plainly a mere colour variation of *G. aburæ*, Ploetz (*vide supra*).

117. G. JOHNSTONI, Butl. (Plate II. fig. 6.)

Aeromachus (?) *johnstoni*, Butl. P. Z. S. 1893, p. 673.

Hab. British Central Africa (*Butl.*); French Congo (*Good*).

I have several specimens of this little species from the Valley of the Ogové, agreeing absolutely with the type. It is closely allied to the species described herein as *G. minima*, Holl., but may be distinguished at once by its somewhat larger size, and the fact

that the anal extremity of the abdomen is white, which is not the case in *G. minima*, Holl.

118. G. SUBFACATUS, Mab. (Plate II. fig. 11.)

Cobalus subfacatus, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. clxviii (1889).

Hab. Sierra Leone (*Mabille*).

This little species is not white at the end of the abdomen, nor has it the interrupted white line along the inner margin of the secondaries which is conspicuous in *G. aburæ*, Ploetz. The lower side in the type, which is before me, is more prevalently tawny on the costa and at the apex of the primaries, as well as on the disk of the secondaries. Otherwise it closely approximates *G. aburæ*, Ploetz, var. *diversata*, Holl.

119. G. MINIMA, sp. nov. (Plate IV. fig. 24.)

♂. Primaries and secondaries on the upperside black. The primaries are ornamented by two minute spots near the end of the cell, of which the lower one is the larger. Immediately below this spot, in interval 2, is a moderately large sublunate transparent spot, and beyond this in the same series, in intervals 3 and 4, a small spot in each interval. Beyond the cell there is a minute subapical spot. The secondaries have a very small and obscure, scarcely visible, translucent spot at the end of the cell. The primaries and secondaries on the underside are blackish, with The the inner margin of the primaries slightly laved with fulvous. secondaries are obscurely marked with purplish hoary scales. The cilia, both on the upper and lower side, are pale yellowish fuscous. The palpi are black on the upperside, yellowish underneath. The thorax and abdomen on the lower side are blackish.

Expanse 19–20 mm.

Hab. French Congo (*Mocquerys*).

This small species is allied to *G. subfacatus*, Mab., but appears to be quite distinct.

120. G. MOCQUERYSII, sp. nov. (Plate V. fig 10.)

♂. The upperside of the body, the primaries, and the secondaries are black. The primaries are ornamented with three minute subapical spots in the usual position. In some specimens these spots have a tendency to become obsolete. There are two minute white translucent spots at the end of the cell in the primaries, and just below them in interval 2 a subquadrate spot. On vein 1, near the middle in interval 1, is a small subtriangular spot, in interval 3, beyond the end of the cell, a moderately large subquadrate spot. In the male on the secondaries there is a large translucent spot at the end of the cell, and two similar elongated spots beyond the end of the cell on either side of vein 3 at its origin. On the underside the primaries are greenish ochraceous, with the inner half of the wing broadly laved with blackish,

shading into fuscous at the outer angle. There is a series of marginal black spots near the apex, and the translucent subapical spots are defined outwardly by blackish markings. There is a fine marginal black line. The cilia are blackish, checkered with whitish on the intervals. On the upperside the cilia are whitish, checkered with blackish at the ends of the nervules. The secondaries on the underside are greenish ochraceous, with the anal angle broadly marked with fuscous. There are three distinct black subcostal spots, a series of black marginal markings, and the translucent spots are narrowly defined by fine blackish lines.

♀. The female is like the male, but lacks the translucent spot at the end of cell of the secondaries.

Expanse ♂ ♀ 25–27 mm.

Types in coll. Staudinger.

Hab. French Congo (*Mocquerys*).

This species is very closely allied to *G. heterochrus*, Mab., from which, however, it may be easily distinguished by the markings of the cilia, and the absence of the patch of light colour which prevails in the secondaries at the anal angle of that species, and by the fact that the lower side of the abdomen is not bright yellowish as in *G. heterochrus*, but greenish ochraceous. There are other distinguishing markings, but these points will suffice at once to separate these species.

121. G. SUBFLAVIDUS, Mab. MS., sp. nov. (Plate V. fig. 16.)

Pamphila subflavidus, Mab. MS., in Staud. coll.

♂. Primaries and secondaries on the upperside blackish; cilia of secondaries narrowly white. The primaries are ornamented by a small roundish subapical translucent spot just below the end of the cell, by a small subquadrate spot of the same character in the cell near the lower angle, and by three larger spots on intervals 1, 2, and 3. The spot on interval 1 is subtriangular, on interval 2 subquadrate, and on interval 3 sublunate. The secondaries are ornamented by two translucent wedge-shaped spots on either side of vein 3 near its origin, the uppermost spot being produced beyond the lower. On the lower side the primaries are black, with a small white ray at the base, and with the apical extremity marked with greenish ochraceous. There is a fine marginal black line, two minute blackish spots near the apex, and on either side of vein 5, near the outer margin, whitish markings. The secondaries on the underside are pale straw-colour, with the outer margin and the costa clouded with darker brown markings. On interval 2 there is a dark brownish spot about halfway from the base. A small black spot is found below the costa near the origin of the subcostal nervures, and there is a similar small black spot near the end of the cell. The palpi on the upperside are black, on the lower side straw-yellow, as is also the entire lower side of the thorax and the abdomen. The abdomen towards its

anal extremity is annulated on the lower side with brown, and at the anal extremity there is a tuft of blackish hairs.

Expanse 28 mm.

Type in coll. Staudinger.

Hab. Usagara, East Africa.

This species is somewhat allied in its markings to *G. aretina*, Hew., from which, however, it is abundantly distinct. It is undoubtedly a good species.

122. G. ARETINA, Hew.

Ceratrichia aretina, Hew. Ann. & Mag. Nat. Hist. (5) vol. i. p. 343 (1878).

Apaustus dolus, Ploetz, S. E. Z. vol. xl. p. 358 (1879), vol. xlv. p. 151 (1884); Karsch, Berl. Ent. Zeit. 1893, p. 260 pl. vi. fig. 13.

Gastrochæta albiventris, Mab. MS., in Staudinger coll.

Hab. Old Calabar (*Hew.*); Gaboon (*Good*); Togoland (*Karsch*); Loko (*Staudinger*).

I have compared the specimens in my collection with the type of *C. aretina*, Hew., and find them to be identical. The representation of *Apaustus dolus*, Ploetz, given by Karsch, is a most excellent representation of *G. aretina*, as is shown both by comparison with the insect and with a carefully executed figure of the type made for me by Mr. Horace Knight, of London. Mons. Mabille identified the specimens I took with me to Paris as his *Gastrochæta albiventris*, comparing them with the type so labelled in the Staudinger collection, which is now again before me as I write. I cannot find any record of the publication of this name by Mons. Mabille, but it may possibly have eluded the vigilance of the compilers of the 'Zoological Record' and others engaged in similar work.

123. G. INDUSIATA, Mab.

Hypoleucis indusiata, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. cxiii (1891); Novit. Lepidopt. p. 117, pl. xvi. fig. 6 (1893).

Hab. Cameroons.

This insect is not congeneric with the type of *Hypoleucis*, which is at best a very doubtful genus. It appears to be more correctly referred to the genus *Goryyra*. With the exception of the type and a single specimen contained in my collection I do not know of any others in the museums of the world up to the present time. The type is in the Staudinger collection.

124. G. RUBESCENS, sp. nov. (Plate IV. figs. 17 ♂, 18 ♀.)

♂. Antennæ black, marked with white below before the end of the club. Palpi black on the upperside, pale yellow beneath. Upperside of thorax and abdomen dark brown; lower side of thorax and abdomen obscure ochraceous. The primaries on the upperside are bright rufous, with the costa and the outer margin broadly

black. There are two translucent spots at the end of the cell, the upper small, the lower linear, fused with each other. There are two translucent wedge-shaped spots on intervals 2 and 3 on either side of vein 3 at its origin, and there are three translucent subapical spots in the usual position, the lower one the largest and elongated, the two upper ones inclined to obsolescence. These translucent spots are only visible when the specimens are held up to the light. The secondaries are bright rufous, like the primaries, with the costa very broadly, and the outer margin more narrowly bordered with black. A long black ray runs from the base to the outer margin before the anal angle. There is a wedge-shaped translucent spot at the end of the cell near its lower edge, and two similar spots on either side of vein 3 at its origin. These spots, like those in the primaries, are only visible when the specimen is held up to the light. On the underside the primaries are dull reddish fuscous, with a pale yellow suffused spot on the inner margin about the middle. A black elongated spot extends from the base outwardly on the cell as far as the inner margin of the translucent spots. These spots are defined outwardly beyond the cell by broad black markings. Near the apex, on the intercostal interspaces, there is a series of submarginal fuscous markings, and the margin is defined by a fine marginal line. The cilia are fuscous. On the underside of the secondaries the prevalent colour is fuscous ochraceous, the translucent spots being distinctly defined on this side, and having a reddish waxy colour. There is a curved series of black submarginal markings extending round the wing, the spots below the costal margin being most conspicuous. There is also a series of small marginal black spots, and a fine black marginal line. The anal angle is touched with dark brown. The black ray running from the base to the outer margin is obscurely indicated on the lower side and interrupted before the anal angle by a blackish annulus, pupilled with pale yellow.

♀. The antennæ, palpi, and body are marked as in the male, but the underside of the body is paler, the lower side of the palpi and the end of the abdomen on the underside being very pale straw-yellow. The primaries on the upperside are black, clothed with greenish scales at the base, along the costa, and the inner margin. The translucent spots in the primaries are bright yellow, standing out conspicuously upon the black ground-colour. The secondaries are marked as in the male, but the black border of the costa is broader and blacker, and the light portions of the wing are bright straw-yellow instead of rufous. The cilia on the upperside at the inner angle both of the primaries and secondaries are whitish. On the underside the ground-colour is bright yellow-ochraceous, with all the black markings as in the male, but broader and more clearly defined upon the pale ground-colour. The spots on the secondaries, which are prevalently bright yellow-ochraceous, are very sharply defined. The black ray on the secondaries running from the base to the inner angle is replaced by three

spots—a fine linear spot near the base, a conspicuous round black spot about the middle, and a geminate black spot near the outer margin, all on interval 1.

Expanse, ♂ 26 mm., ♀ 28 mm.

Hab. Valley of the Ogové (*Good, Mocquerys*).

The very great difference in the coloration of this species from that of other species referred by me to the genus *Gorgyra*, and the dissimilarity between the male and female, analogous to that which is found in the various species contained in the genera *Osmodes* and *Pardaleodes*, have long led me to hesitate in referring this species to the genus in which I have finally placed it. A careful anatomical investigation made with bleached specimens under the microscope has made it plain to me that there is almost no structural difference. The form of the palpi, the antennæ, and the neuration is identical with that of the other species referred to *Gorgyra*. The species constitutes a section of the genus separate from its allies on account of the distinct coloration and the diversity in facies between male and female.

GASTROCHÆTA, Mab. MS., gen. nov.

Antennæ slender, moderately long, reaching beyond the middle of the costa; club moderate, gradually thickened, tapering to a fine point, terminal portion bent, but not hooked. Fore wing: in the male produced at apex, in the female somewhat more rounded and broader; the inner margin a little longer than the outer margin. The cell two-thirds the length of the costa. Vein 12 reaching the costa a little beyond the end of the cell.

Neuration and palpi of *Gastrochæta meza*, Hew. ♮.

The upper end of the cell is rounded between veins 11 and 6, and these veins are given forth from this rounded extremity. The upper and middle discocellulars form an obtuse angle with each other pointing inwardly. The middle and lower discocellulars form an obtuse angle with each other pointing outwardly. Vein 5 is slightly nearer vein 4 than vein 6; vein 3 from a little before the end of the cell; vein 2 a little beyond the middle of the cell.

The secondaries are suboval, with the outer margin evenly rounded. The costal and inner margins are straight between the angles. The cell is long, reaching a little beyond the middle of the wing. Vein 7 before the end of the cell, twice as far from 6 as 8; discocellulars faint, erect; vein 5 present, equidistant from veins 4 and 6; vein 3 before the end of the cell; vein 2 twice as far from the base as from the end of the cell; veins 1 *a* and 1 *b* straight. Between veins 1 *a* and 1 *b* there is a narrow fold heavily clothed with long tufts of hair-like scales. Interval 1 is likewise clothed heavily with long scales. Palpi: first joint short, second joint long, both heavily clothed with scales; second joint erect, rising to the top of the vertex; third joint short, obtuse, slightly porrect, clothed with fine minute closely appressed hairs.

Type *G. mabillei*, Holl.

Mons. Mabille has designated a number of species by the generic name *Gastrochæta* in his own collection and in the collection of Dr. Staudinger, as well as in my own collection. I discover, however, that he has nowhere published an account of this genus. In the 'Entomological News,' vol. v. p. 28, I published a species under this name as *Gastrochæta mabillei*. As this was the first time that the name appears to have been published, the species to which I have applied it must stand as the type of the genus. In many respects there is a superficial resemblance between the species included in this genus and those included in the genus *Gorgyra*, some of the species of which Mons. Mabille has labelled in the Staudinger collection as belonging to that genus. An examination of the palpi and the neuration, however, instantly reveals the difference.

125. G. MABILLEI, Holl.

Gastrochæta mabillei, Holl. Ent. News, vol. v. p. 28, pl. i. figs. 15, 16 (1894).

Hab. Valley of the Ogové.

126. G. MEZA, Hewitson. (Plate II. fig. 9.)

Hesperia meza, Hew. Ann. & Mag. N. H. (4) vol. xix. p. 79 (1877).

Apaustus batea, Ploetz, S. E. Z. vol. xl. p. 359 (1879), vol. xlv. p. 153 (1884).

Pamphila bubovi, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 251, pl. vi. fig. 10 (1894).

Gastrochæta varia, Mab. MS., in Staudinger coll.

Hab. Tropical West Africa, from Angola (*Hew.*) to Togoland (*Karsch*). Very abundant at Gaboon.

This species was originally determined for me by Mons. Mabille as *Gastrochæta varia*, Mab., upon comparison with specimens so labelled in his collection and that of Dr. Staudinger, but I cannot find that he has ever published a description under this name.

127. G. CYBEUTES, Holl.

Gastrochæta cybeutes, Holl. Ent. News, vol. v. p. 94, pl. iii. fig. 15 (1894).

Hab. Valley of the Ogové.

G. CYBEUTES, Holl., var. PALLIDA.

There are two specimens contained in the Staudinger collection in which the markings on the underside of the secondaries are quite obscure, and the general coloration of these wings on the underside is paler. I propose the name *pallida* for this varietal form.

OXYPALPUS, Wats.

128. O. IGNITA, Mab. (Plate III. fig. 12.)

♂. *Pamphila ignita*, Mab. Bull. Soc. Ent. France, (5) vol. vii. p. xl (1877).

Hesperia pyrosa, Ploetz, S. E. Z. vol. xl. p. 356 (1879), vol. xliv. p. 200 (1883).

♂ (?). *Pamphila gisgon*, Mab. C. R. Soc. Ent. Belg. 1891, p. clxxii.

♀. *Pamphila gisgon*, Mab. Novit. Lepidopt. p. 95, pl. xiii. fig. 6 (1893).

Oxypalpus ignita, Watson, P. Z. S. 1893, p. 78.

Hab. Eningo (*Ploetz*); Ogové Valley (*Good*).

Mr. Watson has properly cited *P. gisgon*, Mab., as the female of *P. ignita*, Mab. All the specimens of *P. ignita* I have ever seen, some fifty or more, have been males, and all of *P. gisgon* have been females. I had an opportunity of seeing the type of *P. gisgon*, and of pointing out to Mons. Mabille that it is a female. In the 'Novitates' he cites it in the plate as of this sex. On the underside *P. ignita* and *P. gisgon* agree very well. There are two forms, probably seasonal, one smaller and more tawny, the other longer and darker. Both are represented in my collection and that of Dr. Staudinger.

129. O. ANNULIFER, Holl. (Plate III. fig. 11.)

Oxypalpus annulifer, Holl. Ann. & Mag. Nat. Hist., Oct. 1892, p. 293.

Hab. Valley of the Ogové.

130. O. RUSO, Mab. (Plate III. fig. 13.)

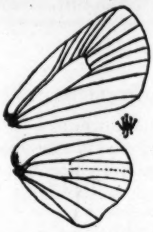
Pamphila ruso, Mab. C. R. Soc. Ent. Belg. vol. xxv. p. clxxxiii (1891).

Oxypalpus ruso, Butl. P. Z. S. 1893, p. 669.

Hab. Bagamoyo (*Mabille*); Zomba (*Butler*).

The type I saw in the collection of Mons. Mabille. The species is not contained either in my own collection or that of Dr. Staudinger. The figure in the plate was drawn from the type.

TEINORHINUS[1], Holl.



Neuration of *Teinorhinus watsoni*, Holl., ♂. ♮.

131. T. WATSONI, Holl. (Plate III. fig. 10.)

T. watsoni, Holl. Ann. & Mag. Nat. Hist., Oct. 1892, p. 292.

Hab. Gaboon.

OSMODES, Wats.

This is a well-marked genus, the males of which may be distinguished at a glance by the patch of glandular raised scales located on the secondaries near the cell. The females differ greatly from the males upon the side, and in several species seem to be very closely related to each other in the pattern of the markings. In fact it is in many cases possible to discriminate between them only by paying the most careful attention to small points of difference, and by having specimens taken *in coitu*. Fortunately I have been able to satisfactorily solve most of the puzzling problems which the difference of the sexes present, thanks to the possession of vast series of specimens, carefully collected and accompanied by satisfactory observations in the field. It may be said that it seems to me that there is strong probability that several of the species are dimorphic. But further research upon the ground is necessary to establish this supposition.

132. O. LARONIA, Hew. (Plate IV. figs. 1 ♂, 2 ♀.)

O. laronia, Hew. Descript. Hesper. p. 35 (1868).

Plastingia laronia, Ploetz, S. E. Z. vol. xl. p. 356 (1879), vol. xlv. p. 145–6 (1884).

Osmodes laronia, Wats. P. Z. S. 1893, p. 78.

Hab. Gold Coast, Gaboon.

This species is labelled *Plastingia bicuta* by Mons. Mabille in Dr. Staudinger's collection, but the name has never been published.

133. O. THORA, Ploetz. (Plate IV. figs. 3 ♂, 5 ♀.)

Plastingia thora, Ploetz, S. E. Z. vol. xlv. p. 145 (1884).

Osmodes thora, Wats. P. Z. S. 1893, p. 79.

Hab. Guinea (*Ploetz*), Gaboon (*Good*).

[1] By a misprint in the 'Annals,' originally published as "*Teniorhinus*."

This species is much paler and brighter on the underside than any other in the genus known to me. It is barely possible that the species named by me in this paper *Osmodes thops* may be a seasonally dimorphic form of *thora*. The males agree almost perfectly upon the upperside, but on the underside *thops* is invariably darker, and the female of *thops* has the orange spots on the upperside larger and differing materially in outline.

134. O. ADON, Mab. (Plate IV. figs. 13 ♂, 15 ♀.)

Pamphila adon, Mab. Bull. Soc. Ent. France, 1889, p. cxlix.

Hab. Sierra Leone, Gaboon.

The description given by Mons. Mabille is based upon a specimen in which the lower side of the secondaries shows but two silvery spots. I have a series of about one hundred specimens, which reveal that there is variation in this respect from specimens which have no silvery spots at all to those which have five or six. The type specimen in Mons. Mabille's collection is one which I had the pleasure myself of communicating to him, and represents a less spotted form than is quite common. A similar specimen in the Staudinger collection he has designated as a "type." This species is undoubtedly dimorphic. I have specimens, larger in size than the typical form, in which the deep black basal portion of the primaries is not invaded near the inner margin by a narrow ray of the bright orange of the median band, as is the case in the type. But, aside from this, I find no distinction worthy of consideration.

135. O. CHRYSAUGE, Mab. (Plate IV. fig. 7.)

Pamphila chrysauge, Mab. C. R. Soc. Ent. Belg. 1891, p. clxxii; Novit. Lepidopt. p. 93, pl. xiii. fig. 4 (1893).

Hab. Loko (*Mabille*), Cameroons (*Good*).

This species resembles *O. laronia*, Hew., at first sight, the subapical orange spot being confluent with the orange-coloured discal area of the primaries. But the black marginal band on the primaries is even on its inward margin and not deeply incised at the nervules, as is the case in *laronia*. The costal margin of the secondaries is also much more broadly marked with black. Compared with *adosus*, a closely allied species, it may be observed that the raised patch of scales on the secondaries is oval in *chrysauge*, and not so nearly circular as in *O. adosus*, and is blackish, not reddish, as in the latter species; there is a small, linear, velvety mark near this spot upon the inner margin, which is entirely lacking in *adosus*. Besides the ground-colour in *O. chrysauge* is slightly paler than in *O. adosus*, and the black inner marginal border is narrower in the secondaries than in the last-mentioned species.

136. O. ADOSUS, Mab. (Plate IV. fig. 10.)

Pamphila adosus, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. cxlix (1889).

♀. *Pamphila argenteipuncta*, Mab. MS.

Hab. Sierra Leone (*Mabille*); Gaboon (*Good*).

I have the figure of a female *Osmodes* to which Mons. Mabille has affixed the name *argenteigutta*, and to the original type of which in the Staudinger collection he has attached the name *argenteipuncta*. It is undoubtedly the female of the species named *adosus* by him. I know this because I have specimens of the two taken *in coitu*.

137. O. LUX, Holl. (Plate IV. figs. 23 ♂, 25 ♀.)

Osmodes lux, Holl. Ann. & Mag. Nat. Hist., Oct. 1892, p. 291.

Hab. Valley of the Ogové.

138. O. STAUDINGERI, sp. nov. (Plate III. fig. 20.)

♀. Antennæ, upperside of head, upper and lower side of thorax, and abdomen dark brown. The palpi on the underside are yellowish. The thorax on the upperside is clothed with a few obscure greenish scales. The primaries and secondaries on the upperside are dark brown. There are two bright yellow confluent spots on the cell near the end, three subapical spots which are situated in the usual place, and a series of spots extending from vein 1 to the subapical spots constituting a sharply defined macular band upon the disc. The lower spot of the series in interval 1 is subtriangular. The spot in interval 2 is elongated, subquadrate, and the largest of the series. The spot in interval 3 is the same form as the spot in interval 2 but smaller. The spots in intervals 4 and 5 are minute, elongated. The lower subapical spot is larger and elongated. The two upper subapical spots are small. In the secondaries there is a small circular yellow spot at the end of the cell, and beyond it an irregularly curved series of five discal spots likewise bright yellow. On the underside the primaries and secondaries are more obscure in colour than on the upperside, the spots and markings being, however, identical in form and position.

Expanse 30 mm.

Hab. Valley of the Ogové.

Type in my collection.

I do not know the male of this species. The solitary female in my collection is, however, so totally distinct from every other species known to me that I do not hesitate to describe it as a new form.

139. O. BANG-HAASII, sp. nov. (Plate IV. fig. 9.)

♂. Antennæ black. Upperside of palpi, head, thorax, and abdomen rufous-brown. Lower side of the palpi, thorax, and abdomen of the same colour, somewhat more obscure. The primaries on the upperside have the ground-colour bright rufous. The apex, the outer margin, and the outer half of the inner margin are broadly deep black. Beyond the end of the cell there is a broad irregular black spot. The costal margin and the base of the wing as far as the middle of the cell are fulvous, shading outwardly about the middle of the wing into blackish. The secondaries are

bright rufous, with the costal margin broadly black, the inner margin somewhat broadly margined with black, the outer margin defined with a moderately broad black marginal line. The cilia are rufous. On the cell is a broad oval patch of raised scales, dark brown in colour. On the underside the wings are more obscurely marked, the spots of the upperside reappearing upon the primaries, but much less sharply defined. The secondaries lack the black costal border and are marked on the disc by a number of minute silvery spots, surrounded by fuscous shadings. Of the spots, the one at the end of the cell is the most conspicuous.

♀. The female presents the usual broad divergence from the male which is characteristic of the genus, and superficially does not apparently differ very widely on the upperside from the female of *O. adosus*, Mab., an allied species. On the underside, however, it agrees almost absolutely with the male in the style of marking.

Expanse, ♂ 26 mm., ♀ 29 mm.

Types in coll. Staudinger.

Hab. French Congo (*Mocquerys*).

This is one of the most distinctly marked species in the genus.

140. O. DISTINCTA, sp. nov. (Plate IV. fig. 16.)

♂. Very closely allied to *O. chrysauge*, Mab., of which it may be a small variety. It differs from the type of *O. chrysauge* in having the apex more broadly black, the subapical yellow spots not being confluent with the broad orange-yellow discal tract as in *chrysauge*. The outer marginal black border is also relatively wider than in *chrysauge*, and the raised patch of scales on the cell of the secondaries is bright fulvous, not dark brown as in *chrysauge*, elongated, and not broadly oval as in the latter species. On the underside of the secondaries the outer margin is not so broadly marked with fulvous as in *chrysauge*.

Expanse 22 mm.

Hab. Gaboon (*Mocquerys*).

141. O. THOPS, sp. nov. (Plate IV. figs. 4 ♂, 6 ♀.)

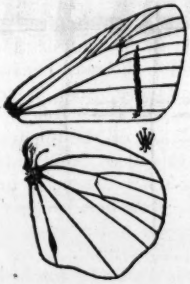
♂. Closely allied to *O. thora*, Ploetz, from which it is to be distinguished by the fact that the black margin of the primaries is narrower than in *thora* and not irregular inwardly as in *thora*, but uniform, and by the fact that the underside of the secondaries is dark brown over the greater portion of the area, whereas in *thora* it is light, the outer margin being pale yellow in *thora*, and the basal half pale glaucous clouded here and there with darker brown.

♀. In the female the spots upon the primaries are broader than in the female of *thora*, while on the secondaries the fulvous spot in *thops* is smaller than the corresponding spot in *thora*.

I have a long series of both males and females, some of the examples taken *in coitu*, and it is perfectly plain that the two species are distinct, though superficially *thops* and *thora* show considerable likeness to each other.

RHABDOMANTIS, gen. nov.

Antennæ: moderately long, nearly two-thirds the length of the costa from the base; club moderate, the terminal portion fine, bent back at right angles. The palpi are as in the genus *Osmodes*.



Neuration of *Rhabdomantis galatia*, Hew. ♀.

Primaries: the cell somewhat less than two-thirds the length of the costa; in the male the outer margin is very little less than the inner margin; in the female the outer margin is much less than the inner margin; vein 12 terminating on the costa before the end of the cell; vein 5 nearer 4 than 6; upper discocellular long, outwardly oblique; middle discocellular very short; lower discocellular short; vein 7 arising a little before the upper angle of the cell, vein 2 originating nearly twice as far from vein 3 as vein 3 is from vein 4. In many specimens of the male there is a remarkable sexual brand composed of androconia arranged in a narrow band extending across the disc in almost a straight line from the middle of interval 5 beyond the end of the cell to the inner margin before the outer angle. This is wanting, however, in some specimens, which otherwise are absolutely indistinguishable from the type (*vide infra* var. *sosia*). Secondaries: the cell about half the width of the wing; the discocellulars faint, erect; vein 5 absent; vein 3 originating a little before the end of the cell; vein 2 originating beyond the middle of the cell; vein 1 *b* widely separated from vein 2; vein 1 *a* near its extremity dilated and marked by a distinct sexual brand; vein 7 originating about two-thirds of the distance from the base. The outer margin is evenly rounded as far as vein 2 and much produced at the extremity of vein 1 *b*, then excavated between the extremities of vein 1 *b* and 1 *a*. The female has the neuration like the male, but the wings are longer, relatively narrower, and there is of course an entire absence of the sexual brands or markings. The style of maculation in this sex closely approximates that of the females in the genus *Osmodes*.

Type *R. galatia*, Hew., =*rhabdophora*, Mab.

142. R. GALATIA, Hew. (Plate III. figs. 8 ♀, 15 ♂.)

Hesperia galatia, Hew. Descript. Hesper. p. 36 (1868).

Pamphila rhabdophorus, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. cxlix (1889).

Dimorphic var. *R. sosia*, Mab.

Pamphila sosia, Mab. C. R. Soc. Ent. Belg. 1891, p. clxxi.

Hab. Old Calabar (*Hewitson*); Gaboon (*Good*); Mozambique (*Mabille*).

I have an enormous series of specimens of this insect, both males and females. It is absolutely impossible to distinguish between the females of *R. galatia* and *R. sosia*. *Sosia* merely differs from *galatia* in being without the raised velvety brand of scales upon the primaries below the end of the cell. Some vestiges of this sexual mark, however, appear in a few specimens. I am perfectly convinced that the insects do not specifically differ from each other, and that we are simply dealing here with dimorphism affecting the sexual stigmata of the male sex. This is a singular fact, and, so far as my observation extends, hitherto unobserved.

PAROSMODES, gen. nov.

Closely allied to the genus *Osmodes*, from which it differs principally in the form of the palpi, the third joint of which is long and porrect, whereas in typical *Osmodes* the third joint is short and suberect.

The antennæ are moderately long, exceeding the middle of the costa. The neuration of the primaries and the secondaries is as in *Osmodes*, and there is likewise at the origin of veins 2 and 3 of the secondaries a raised patch of scales as in *Osmodes*. The primaries, as in the latter genus, have also a long tuft of hairs about the middle of the hind margin; these hairs are ordinarily folded forward against the under surface of the primaries as in *Osmodes*.

Type *P. morantii*, Trim.

143. P. MORANTII, Trim.

Pamphila morantii, Trim. Trans. Ent. Soc. Lond. 1873, p. 122.

Pamphila ranoha, Westw. App. Oates's Matabeleland, p. 353 (1881).

Pamphila morantii, Trim. S. Afr. Butt. vol. iii. p. 311, pl. xii. fig. 3 (1889).

Osmodes ranoha, Butl. P. Z. S. 1893, p. 670.

Hab. South Africa and South Tropical Africa.

144. P. ICTERIA, Mab.

Pamphila icteria, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. clxxx (1821).

Pamphila zimbaso, Trim. P. Z. S. 1894, p. 74, pl. vi. fig. 17 ♀.

Hab. Manica-land (*Trimen*); Transvaal (*Mabille*).

The type of *icteria* is before me as I write. It is strictly congeneric with *morantii*, Trim.

145. P. HARONA, Westw.

Pamphila harona, Westw. App. Oates's Matabeleland, p. 353 (1881); Trim. P. Z. S. 1894, p. 74.

Hab. Manica-land (*Trimen*); Falls of the Zambezi (*Westwood*).

OSPHANTES, gen. nov.

Antennæ moderately long, slender; club gradually enlarging and terminating in a fine point, the terminal portion being recurved. The palpi are short, appressed, suberect, the first joint short, the second long, both densely covered with thick scales. The third joint is minute, conical. The hind tibiæ are armed with a double pair of spurs. The primaries have the inner margin strongly angulated about the middle and clothed with a long bundle of hairs on the elongated portion of the hind margin, which is as long as the outer margin. Vein 5 nearer 4 than 6. Vein 12 terminating on the costa before the end of the cell. The cell more than half the length of the costa. The secondaries have the neuration as in *Osmodes*. On the lower edge of the cell and about the origin of veins 2 and 3, the cell of the secondaries is naked, marked by an opaque tract, suboval in form, having a glazed appearance. Immediately behind this naked glazed tract is a pocket-like depression on the upperside lying between vein 1 *b* and the lower margin of the cell near the base. The primaries on the underside have the basal portion almost naked toward the base, covered with shining closely appressed scales.

Type *O. ogowena*, Mab.

I was inclined originally to refer this peculiar species to *Osmodes*, to which it is allied, but the very peculiar structure of the hind wing shows such a great divergence from the typical species of *Osmodes* that I feel constrained to erect a new genus for its reception. Furthermore, the coloration of the insect differs in many important particulars from that of typical *Osmodes*. The figure of the insect given in the 'Novitates' by Mabille is sufficiently characteristic, though the spots on the underside are not delineated as they are in the examples before me. They recall somewhat in the specimens I have the maculation of *Padraona zeno*, Trim.

146. O. OGOWENA, Mab.

Plastingia ogowena, Mab. C. R. Soc. Ent. Belg. 1891, p. cxxi; Novit. Lepidopt. p. 94, pl. xiii. fig. 5.

Hab. Valley of the Ogové.

This species was evidently placed by Mons. Mabille with doubt in the genus *Plastingia*, in which he has put a number of other African species. The type of *Plastingia* is *flavescens*, Feld., with which this species has but little in common, save the general style of coloration. It does not agree with any other African species

known to me, though coming nearer certain species of *Osmodes* than any others. I have therefore not hesitated to erect a new genus for its reception.

Hypoleucis, Mab.

147. H. tripunctata, Mab.

Hypoleucis tripunctata, Mab. C. R. Soc. Ent. Belg. 1891, p. lxix.
Hypoleucis titanota, Karsch, Berl. Ent. Zeit. 1893, p. 254, pl. vi. fig. 5.

Hab. West Africa. Common in the valley of the Ogové.

I have specimens determined by Mons. Mabille and compared with his type, which show that the form figured by Karsch in his excellent plate is identical.

148. H. ophiusa, Hew.

Hesperia ophiusa, Hew. Trans. Ent. Soc. Lond. (3) vol. ii. p. 497 (1866); Exot. Lep. vol. v; Hesper. pl. v. figs. 46–48 (1873).
Hypoleucis ophiusa, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. lxix (1891); Wats. P. Z. S. 1893, p. 82–3; Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 254 (1893).

Hab. Tropical Western Africa.

149. H. cretacea, Snell.

Goniloba cretacea, Snellen, Tijd. voor Entom. 1872, p. 27, pl. ii. figs. 4, 5, & 6.
Hesperia camerona, Ploetz, S. E. Z. vol. xl. p. 356 (1879), vol. xliv. p. 48 (1883).
Pamphila leucosoma, Mab. Pet. Nouv. Entom. vol. ii. 1877, p. 114.
Pamphila camerona, Karsch, Berl. Ent. Zeit. p. 250, pl. vi. fig. 9 (1893).

Hab. Tropical West Africa. Common at Gaboon and on Congo; Togoland (*Karsch*).

The female differs from the male in not having the extremity of the abdomen white and having the wings broader. The figure of *G. cretacea* given by Snellen exaggerates slightly the pale markings on the underside of the secondaries, while that given by Karsch does not show them as they are commonly found. I have specimens, however, which agree nearly with both representations, and which reveal that there is considerable variation in the distinctness of these markings. My collection contains a series of forty specimens taken at different times and places.

150. H.? enantia, Karsch. (Plate II. fig. 17.)

Hypoleucis enantia, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 255 (1893).

Hab. Togoland (*Karsch*).

The species was described from a headless example. My conviction is, from the examination of a careful drawing made by Herr Prillwitz, which is reproduced in one of the plates accompanying this article, that we are dealing here with a species of *Ceratrichia* allied to, and perhaps identical with, *C. stellata*, Mab.

CYCLOPIDES, Hübn.

151. C. METIS, Linn.

Papilio metis, Linn. Mus. Lud. Ulr. p. 325 (1764); Syst. Nat. ed. xii. p. 792 (1767); Dru. Ill. Exot. Ent. vol. ii. p. 28, pl. xvi. figs. 3, 4 (1773); Fabr. Syst. Ent. p. 528 (1775); Cram. Pap. Exot. vol. ii. p. 103, pl. clxii. fig. G (1777); Fabr. Spec. Ins. vol. ii. p. 132 (1781); Wulfen, Ins. Capens. p. xxxiii (1786); Fabr. Mant. Ins. vol. ii. p. 85 (1787); Gmel. Syst. Nat. i. 5, p. 2355 (1790); Thunberg, Mus. Nat. Ups. xxiii. p. 9 (1804).

Hesperia metis, Fabr. Ent. Syst. iii. 1, p. 329 (1793); Latr. Enc. Méth. vol. ix. p. 776 (1823).

Cyclopides metis, Hübn. Verz. p. 112 (1816); Trim. Rhop. Afr. Austr. vol. ii. p. 293 (1866); S. Afr. Butt. vol. iii. p. 266 (1889).

Heteropterus metis, Wallgr. Rhop. Caffr. p. 46 (1857); Kirby, Syn. Cat. p. 623 (1871); Auriv. Kongl. Sv. Vet.-Akad. Handl. Bd. xix. no. 5 (1882); Staudgr. Exot. Schmett. vol. i. pl. 100 (1888).

Cyclopides metis, Watson, P. Z. S. 1893, p. 90.

Hab. S. Africa.

152. C. MALGACHA, Boisd.

Steropes malgacha, Boisd. Faune Ent. Madgr. p. 67 (1833).

Hesperia limpopana, Wallgr. K. Sv. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 50 (1857).

Cyclopides malgacha, Trim. Rhop. Afr. Austr. vol. ii. p. 294, pl. v. fig. 10 (1866); Grandid. Madgr. vol. xviii. p. 344, pl. lii. figs. 6, 6 *a* (1887); Trim. S. Afr. Butt. vol. iii. p. 268 (1889); Watson, P. Z. S. 1893, p. 90.

Hab. S. Africa, Madagascar.

153. C. ÆGIPAN, Trim.

Cyclopides ægipan, Trim. Trans. Ent. Soc. Lond. 1868, p. 94, pl. vi. fig. 9; S. Afr. Butt. vol. iii. p. 271 (1889); Watson, P. Z. S. Lond. 1893, p. 90.

Hab. S. Africa.

154. C. WILLEMI, Wallgr.

Heteropterus willemi, Wallgr. K. Sv. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 47 (1857).

Cyclopides? willemi, Trim. Rhop. Afr. Austr. vol. ii. p. 296 (1866).

Cyclopides cheles, Hew. Descript. One Hundred New Species

Hesp. ii. p. 42 (1868); Exot. Butt. vol. v. pl. 59. figs. 12, 13 (1874).

Cyclopides willemi, Trim. S. Afr. Butt. vol. iii. p. 273 (1889); Watson, P. Z. S. Lond. 1893, p. 90.

Hab. S. Africa, North and South Tropical Africa.

155. C. MENINX, Trim.

Cyclopides meninx, Trim. Trans. Ent. Soc. Lond. 1873, p. 121, pl. i. fig. 12.

Thymelicus meninx, Wallgr. Œfv. K. Vet.-Akad. Forh. 1875, p. 92.

Cyclopides argenteostriatus, Ploetz, S. E. Z. vol. xlvii. p. 110 (1886); Watson, P. Z. S. 1893, p. 90.

Hab. S. Africa.

156. C. SYRINX, Trim.

Cyclopides syrinx, Trim. Trans. Ent. Soc. Lond. 1868, p. 93, pl. v. fig. 8, 1870, p. 387; S. Afr. Butt. vol. iii. p. 269 (1889).

Hab. Cape Colony.

157. C. ABJECTA, Snellen.

Cyclopides abjecta, Snell. Tijd. voor Entom. 1872, p. 52, pl. ii. figs. 15, 16.

Steropes furvus, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. clvi (1889).

Cyclopides uniformis, Karsch, Berl. Ent. Zeit. 1893, p. 245.

Hab. Guinea (*Snellen*); Sierra Leone (*Mab.*); Togoland (*Karsch*).

I think the above synonymy will be found to be correct. The type of Mons. Mabille appears plainly to agree in all particulars with the figure of Snellen, and also with an excellent drawing of *C. uniformis*, Karsch, kindly provided by the author.

158. C. FORMOSUS, Butl.

Heteropterus formosus, Butl. P. Z. S. 1893, p. 670, pl. lx. fig. 8.

Hab. Zomba, British Central Africa.

159. C. QUADRISIGNATUS, Butl.

Cyclopides quadrisignatus, Butl. P. Z. S. 1893, p. 670, pl. lx. fig. 9.

Hab. Zomba, British Central Africa.

160. C. MIDAS, Butl.

Cyclopides midas, Butl. P. Z. S. 1893, p. 671, 1895, p. 265, pl. xv. fig. 6.

Hab. Zomba, British Central Africa (*Butler*).

161. C. LEPELETIERII, Latr.

Hesperia lepeletier, Latr. Enc. Méth. vol. ix. p. 777 (1823).
Cyclopides lepeletierii, Trim. (part.) Rhop. Afr. Austr. vol. ii. p. 295 (1866); S. Afr. Butt. vol. iii. p. 274 (1889).
Baracus lepeletierii, Watson, P. Z. S 1893, p. 114.

Hab. Southern Africa.

It is with some hesitation that I decline to accept the reference of this and the two following species to Moore's genus *Baracus*, made by Mr. Watson. The thoroughness of Mr. Watson's work should give great weight to his opinions, but in this case, after a careful examination of typical specimens of *C. lepeletierii* and its three congeners, which have been placed in *Baracus*, I am compelled to conclude that the differences are too slight in fact to warrant such a departure from the hitherto received classification of the insects.

162. C. INORNATUS, Trim.

Cyclopides inornatus, Trim. Trans. Ent. Soc. Lond. (3) vol. ii. p. 179 (1864); Rhop. Afr. Austr. vol. ii. p. 295, pl. v. fig. 11 (1866); S. Afr. Butt. vol. iii. p. 277.
Baracus inornatus, Watson, P. Z. S. 1893, p. 114.

Hab. South Africa.

163. C. ANOMÆUS, Ploetz. (Plate I. fig. 6.)

Apaustus anomœus, Ploetz, S. E. Z. vol. xl. p. 358 (1879), vol xlv. p. 152.

Hab. Aburi (*Ploetz*).

The type is preserved in the Berlin Museum. A good specimen is contained in the collection of Dr. Staudinger, to which Mons. Mabille has affixed the manuscript name "*acosimus*."

164. C. TSITA, Trim.

Cyclopides tsita, Trim. Trans. Ent. Soc. Lond. 1870, p. 386, pl. vi. fig. 13; S. Afr. Butt. vol. iii. p. 276.
Baracus tsita, Watson, P. Z. S. 1893, p. 114.
Steropes monochromus, Mab. C. R. Soc. Ent. Belg. 1891, p. lxiv.

Hab. South Africa.

165. C. ARGENTEOGUTTA, Butl.

Cyclopides argenteogutta, Butl. Lepid. Exot. p. 188, pl. lxiv. fig. 8.

Hab. Nubia (*Butler*).

From the figure given by Dr. Butler it appears a little doubtful whether this species is a true *Cyclopides*.

166. C. (?) PAOLA, Ploetz.

Cyclopides paola, Ploetz, S. E. Z. vol. xlv. pp. 391–2 (1884).

Hab. Angola (*Ploetz*).

I doubt the reference of this species to *Cyclopides*. The

description seems to me to point to a form belonging to some other genus.

167. C. (?) BRUNNEOSTRIGA, Ploetz.

Cyclopides brunneostriga, Ploetz, S. E. Z. vol. xlv. p. 392–3 (1884).

Hab. Pundo Ndongo (*Ploetz*).

This is probably not a true *Cyclopides*.

168. C. ROMI, Robbe.

Cyclopides romi, Robbe, Ann. Soc. Ent. Belg. vol. xxxvi. p. 133 (1892)

Hab. Congo.

I cannot make much out of the brief description of Dr. Robbe. The description would apply perfectly, so far as it goes, to *Cyclopides syrinx*, Trim.

169. C. AMENA, Grose Smith.

Cyclopides amena, H. Grose Smith, Ann. & Mag. N. H. (6) vol. vii. p. 127 (1891).

Hab. Madagascar.

This species is compared by its author to *C. pardalinus*, Butl., which Mr. Watson has referred with its allies to the genus *Ampittia*, but which, after examining the types, I prefer to restore to *Cyclopides*.

170. C. RHADAMA, Boisd.

Steropes rhadama, Boisd. Faune Madgr. p. 69, pl. ix. figs. 10, 11 (1833).

Heteropterus rhadama, Kirby, Syn. Cat. p. 623 (1871).

Cyclopides rhadama, Mab. Grandid. Madgr. vol. xviii. p. 343, pl. lvi. *a*. figs. 2, 2 *a* (1887).

Ampittia rhadama, Watson, P. Z. S. 1893, p. 96.

Hab. Madagascar.

171. C. PARDALINA, Butl.

Cyclopides pardalina, Butl. Ann. & Mag. N. H. (5) vol. iv. p. 233 (1879).

Heteropterus pardalinus, Mab. Grandid. Madgr. vol. xviii. p. 345, pl. lii. figs. 7, 7 *a* (1887).

Ampittia pardalina, Watson, P. Z. S. 1893, p. 96.

Hab. Madagascar.

172. C. MIRZA, Mab.

Cyclopides mirza, Mab. Grandid. Madgr. vol. xviii. p. 342, pl. lii. figs. 3, 3 *a* (1887).

Ampittia mirza, Watson, P. Z. S. 1893, p. 96.

Hab. Madagascar.

173. C. BERNIERI, Boisd.

Steropes bernieri, Boisd. Faune Madgr. p. 68, pl. ix. fig. 9 (1833).
Cyclopides bernieri, Mab. Grandid. Madgr. vol. xviii. p. 342, pl. lii. figs. 5, 5 *a* (1887).
Ampittia bernieri, Watson, P. Z. S. 1893, p. 96.
Hab. Madagascar.

174. C. DISPAR, Mab.

Cyclopides dispar, Mab. Bull. Soc. Ent. France, (5) vol. vii. p. lxxiii (1877).
Heteropterus dispar, Mab. Grandid. Madgr. vol. xviii. p. 346, pl. lii. figs. 8, 8 *a*, 9, 9 *a* (1887).
Ampittia? dispar, Watson, P. Z. S. 1893, p. 96.
Hab. Madagascar.

175. C. SACLAVUS, Mab.

Cyclopides saclavus, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. cvii (1891).
Hab. Madagascar.

176. C. (?) PHIDYLE, Walker.

Cyclopides phidyle, Walker, the Entomologist, vol. v. p. 56 (1870).
Hab. Hor Tamanib (*Walker*).
I cannot make out this species. I cannot discover where the type is, if it still exists. The insect remains to be rediscovered.

177. C. (?) LYNX, Moeschler.

Cyclopides lynx, Moeschl. Verhandl. d. k. k. zool.-bot. Ges. Wien, Bd. xxviii. p. 210 (1879).
Hab. Africa?
Moeschler with some degree of doubt assigns this species to the African fauna. It may be Asiatic. I do not know it except by the description referred to above.

178. C. (?) STELLATA, Mab.

Ceratrichia stellata, Mab. C. R. Soc. Ent. Belg. 1891, p. lxv; Butler, P. Z. S. 1893, p. 673.
Cyclopides mineni, Trim. P. Z. S. 1894, p. 72, pl. vi. fig. 16.
Hab. Mombasa (*Mabille*); British Central Africa (*Butler*); Manica (*Trimen*).
The type is in the collection of Dr. Staudinger. It is a female. There is also a cotype, a male, which is much smaller and badly worn, lacking altogether the cilia on the wings and minus the antennæ. The original reference of this species to the genus *Ceratrichia*, which has been followed by Dr. Butler and others, is

not correct, nor is the reference of the species to the genus *Cyclopides* made by Mr. Trimen much better, though certainly more natural than the original location. I have been tempted to erect a new genus for the reception of this and the following form, but with the insufficient material at my command for a close anatomical study I refrain. Manifestly the much shorter antennæ, with obtuse clubs, the long cilia of the primaries and the secondaries, the rounded apex of the primaries, and the different general outline of the wings point to a different generic location than that given by the author of the species.

179. C. (?) PUNCTULATA, Butl.

Ceratrichia punctulata, Butl. P. Z. S. 1895, p. 265, pl. xv. fig. 7.

Hab. British Central Africa (*Butler*).

I think it very doubtful whether this is more than varietally distinct from the foregoing species.

PROSOPALPUS, gen. nov.

Antennæ relatively long, reaching beyond the middle of costa; slender, with a moderately thick and elongated club terminating in a fine point, the terminal portion for a short distance bent, not hooked or recurved. Palpi: first joint short; second joint very long, produced for half of its length beyond the front; both second and third joints heavily clothed with scales; the third joint is long, produced, acute, almost naked. The hind tibiæ have a double pair of spurs. In the primaries the cell is moderately long, its end reaching fully to the middle of the wing; vein 12 terminating slightly before the end of the cell; vein 7 from end of the cell; vein 5 very slightly, if at all, nearer vein 4 than vein 6. The primaries are relatively broad, the outer margin and outer angle evenly rounded. Secondaries: cell short, not reaching to the middle of the wing; vein 5 present, equidistant from veins 4 and 6; vein 7 from before the end of the cell, four times as far from vein 8 as from the end of the cell; vein 8 from very near the base; veins 3 and 4 both from the end of the cell; vein 2 from before the end of the cell; veins 1 *a* and 1 *b* curved; fringes very long; secondaries evenly rounded on the costa and the outer margin to the anal angle; the inner margin nearly straight.

Type *P. duplex*, Mab.

The small species which I have chosen as the type of this genus is very distinct in general appearance from all other species which appear to be in any wise related to it. In the structure of the palpi it approaches somewhat the genera *Gorgyra* and *Parosmodes*. In the form of the wings, broad and evenly rounded, as well as in the almost uniform black coloration, it is widely different from all the species included in those two genera. Instead of being robust, as those species are, it wholly differs, esembling more closely in some respects in the form of its wings

the genus *Cyclopides*. It is worthy of remark that the palpi are wanting in the type specimens of *P. duplex* which are contained in the collection of Dr. Staudinger. I have relied for the description of the palpi upon specimens contained in my own collection, which in their remarkable length obscurely suggest the genus *Libythea*.

180. P. DUPLEX, Mab. (Plate III. fig. 17.)

Cobalus duplex, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. clxix (1889).

Hab. Sierra Leone (*Mabille*); Gaboon (*Good*).

181. P. (?) DEBILIS, Ploetz.

Apaustus debilis, Ploetz, S. E. Z. vol. xl. p. 360 (1879), vol. xlv. p. 158 (1884).

Hab. Guinea (*Ploetz*).

I place this species here on the ground of the near relationship of the preceding species to it, as stated by Mons. Mabille.

AMPITTIA, Moore.

182. A. CARIATE, Hew.

Cyclopides cariate, Hew. Descript. One Hundred New Hesperid. p. 44 (1868); Exot. Butt. vol. v. pl. *Cyclopides*, fig. 8 (1874); Mab. Grandid. Madgr. vol. xviii. p. 341, pl. lii. figs. 4, 4 *a* (1887).

Ampittia cariate, Watson, P. Z. S. 1893, p. 96.

Hab. Madagascar.

183. A. COROLLER, Boisd.

Hesperia coroller, Boisd. Faune Ent. Madgr. p. 66, pl. ix. fig. 8 (1833).

Pamphila coroller, Mab. Grandid. Madgr. vol. xviii. p. 364, pl. liv. figs. 1, 1 *a* (1887).

Padraona (?) *coroller*, Wats. P. Z. S. 1893, p. 102.

Hab. Madagascar.

KEDESTES, Wats.

184. K. LEPENULA, Wallgr.

Hesperia lepenula, Wallgr. K. S. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 50.

Pamphila? lepenula, Trim. Rhop. Afr. Austr. vol. ii. p. 298 (1866).

Cyclopides chersias, Hew. Ann. & Mag. Nat. Hist. (4) vol. xx. p. 327 (1877).

Thymelicus lepenula, Trim. S. Afr. Butt. vol. iii. p. 300, pl. xi. fig. 6 (1889).

Kedestes lepenula, Wats. P. Z. S. 1893, p. 96.

Hab. Southern Africa.

185. K. MACOMO, Trim.

Cyclopides macomo, Trim. Trans. Ent. Soc. Lond. (3) vol. i. p. 405 (1862)

Pamphila macomo, Trim. Rhop. Afr. Austr. vol. ii. p. 297, pl. vi. fig. 6 (1866).

Thymelicus macomo, Staud. Exot. Schmett. vol. i. pl. 100, ♀ (♂ *error*) (1888); Trim. S. Afr. Butt. vol. iii. p. 302 (1889).

Kedestes macomo, Wats. P. Z. S. 1893, p. 96.

Hab. Southern Africa.

186. K. CAPENAS, Hew.

Cyclopides capenas, Hew. Descript. One Hundred New Hesperid. p. 43 (1868); Exot. Butt. vol. v. pl. *Cyclopides*, figs. 2, 3 (1877).

Cyclopides derbice, Hew. Ann. & Mag. Nat. Hist. (4) vol. xx. p. 327 (1877).

Kedestes capenas, Wats. P. Z. S. 1893, p. 96.

Thymelicus capenas, Trim. P. Z. S. 1894, p. 73.

Hab. Manica.

187. K. CHACA, Trim.

Pyrgus chaca, Trim. Trans. Ent. Soc. Lond. 1873, p. 118, pl. i. figs. 9, 10; S. Afr. Butt. vol. iii. p. 296 (1889).

Kedestes chaca, Wats. P. Z. S. 1893, p. 96.

Hab. South Africa; South Tropical Africa.

188. K. TUCUSA, Trim.

Pyrgus tucusa, Trim. Trans. Ent. Soc. Lond. 1883, p. 359; S. Afr. Butt. vol. iii. p. 297 (1889).

Kedestes tucusa, Wats. P. Z. S. 1893, p. 96.

Hab. South Africa.

189. K. MOHOZUTZA, Wallgr.

Hesperia mohozutza, Wallgr. K. Sv. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 50.

Pyrgus mohozutza, Trim. Rhop. Afr. Austr. vol. ii. p. 291, pl. v. fig. 9 (1866); S. Afr. Butt. vol. iii. p. 294 (1889).

Kedestes mohozutza, Wats. P. Z. S. 1893, p. 96.

Hab. South Africa; South Tropical Africa.

190. K. CALLICLES, Hew.

Cyclopides callicles, Hew. Descript. One Hundred New Hesperid. p. 42 (1868); Exot. Butt. vol. v. pl. *Cyclopides*, figs. 10, 11 (1877).

Pamphila callicles, Trim. S. Afr. Butt. vol. iii. p. 309 (1889).

Kedestes callicles, Wats. P. Z. S. 1893, p. 96.

Hab. South Africa; South Tropical and North Tropical Africa.

191. K. BARBERÆ, Trim.

Cyclopides barberæ, Trim. Trans. Ent. Soc. Lond. 1873, p. 120, pl. i. fig. 11; S. Afr. Butt. vol. iii. p. 306 (1889).

Hab. Cape Colony; Mashonaland.

192. K. WALLENGRENII, Trim.

Thymelicus wallengrenii, Trim. Trans. Ent. Soc. Lond. 1883, p. 361; S. Afr. Butt. vol. iii. p. 304, pl. xi. fig. 7 (1889).

Hab. Natal; Mashonaland.

193. K. NIVEOSTRIGA, Trim.

Pamphila? niveostriga, Trim. Trans. Ent. Soc. Lond. (3) vol. ii. p. 179 (1864); Rhop. Afr. Austr. vol. ii. p. 298, pl. vi. fig. 7 (1866); Trans. Ent. Soc. Lond. 1870, p. 389.

Thymelicus niveostriga, Trim. S. Afr. Butt. vol. iii. p. 303 (1889).

Hab. S. Africa.

194. K. FENESTRATUS, Butl. (Plate II. fig. 16.)

Baracus fenestratus, Butl. P. Z. S. 1893, p. 673.

Hab. Zomba, British Central Africa.

This species is very closely allied to, if not identical with, *K. wallengrenii*, Trim.

195. K. (?) LENTIGINOSA, sp. nov. (Plate IV. fig. 22.)

♀. On the upper surface having the general appearance of a female of the genus *Osmodes*, to which genus, however, it plainly cannot be referred, owing to the form of the palpi, which are more nearly those of the genus *Kedestes*. The palpi, head, thorax, and abdomen are black. On the underside the palpi are ochraceous, and the lower side of the abdomen is ochraceous. The primaries are black, marked with two moderately large subapical yellow spots in the usual position, two small confluent yellow spots at the end of the cell, and three moderately large discal yellow spots forming a diminishing series extending from intervals 1 to 3 below the cell. The secondaries are crossed beyond the cell on the middle by a broad curved yellow discal band, diminishing inwardly toward the base. The primaries have the costal margin and the apex broadly ochraceous. The cell and the lower half of the wing are broadly black, upon which the two spots at the end of the cell and the three forming the discal transverse series on the upperside reappear sharply defined against the dark ground. The secondaries are uniformly pale greenish-ochraceous, marked by a few distinct round black spots, one on the cell near its upper margin between veins 6 and 7 beyond the end of the cell, one on either side of vein 3 halfway between the cell and the outer margin, one on interval 1 below the cell near the base, a larger one on the same interval halfway between the base and the outer margin. The cilia of the

primaries brown, on the underside of the secondaries pale ochraceous touched with dark brown near the end of vein 2. Expanse 26 mm.

Type in collection of Dr. Staudinger.

Hab. Gaboon (*Mocquerys*).

ADOPÆA, Billberg.

(*Pelion*, Kirby.)

196. A. THAUMAS, Hufn.

Papilio thaumas, Hufn. Berl. Mag. ii. p. 62 (1776).
♀. *Papilio flavus*, Müll. Prodr. Zool. Dan. p. 115 (1776).
Papilio linea, Wien. Verz. p. 160 (1776).
♀. *Papilio venula*, Hübn. Eur. Schmett. i. figs. 666–669 (1803–1818).
Thymelicus thaumas, Kirby, Syn. Cat. p. 609 (1871).
Hesperia thaumas, Staud. Cat. d. Lép. p. 35 (1871).
Adopæa thaumas, Billb. Enum. Ins. p. 81 (1820); Wats. P. Z. S. 1893, p. 98.
(For fuller synonymy see works on palæarctic Lepidoptera.)
Hab. North Africa.

197. A. LINEOLA, Ochs.

Papilio lineola, Ochs. Schmett. Eur. i. p. 230 (1808).
Papilio virgula, Hübn. Eur. Schmett. i. figs. 660–663 (1803–1818).
Thymelicus lineola, Kirby, Syn. Cat. p. 609 (1871).
Hesperia lineola, Staud. Cat. d. Lép. p. 35 (1871).
Adopæa lineola, Wats. P. Z. S. 1893, p. 98.
(For fuller synonymy see works on palæarctic Lepidoptera.)
Hab. Mediterranean coasts of Africa.

198. A. ACTÆON, Esp.

Papilio actæon, Esp. Schmett. vol. i. pl. xxxvi. fig. 4 (1777); Rott. Naturf. vi. p. 30 (1777).
Papilio actæon, Hübn. Eur. Schmett. i. figs. 488–490 (1798–1803).
Thymelicus actæon, Kirby, Syn. Cat. p. 609 (1771).
Hesperia actæon, Staud. Cat. d. Lép. p. 35 (1871).
Adopæa actæon, Wats. P. Z. S. 1893, p. 98.
(For fuller synonymy see works on palæarctic Lepidoptera.)
Hab. Mediterranean coasts of Africa.

199. A. HAMZA, Oberth.

Hesperia hamza, Oberth. Étud. Ent. i. p. 28, pl. iii. figs. 2 *a*, 2 *b*, 2 *c* (1876).
Hab. Algeria.

GEGENES, Hübn.

(*Philoödus*, Ramb.)

200. G. NOSTRODAMUS, Fabr.

Hesperia nostrodamus, Fabr. Ent. Syst. iii. 1, p. 328 (1793).
Papilio pygmæus, Cyr. (nec Fabr.) Ent. Neap. pl. li. fig. 5 (1787); Hübn. Eur. Schmett. i. figs. 458–460 (1798–1803).
Papilio pumilio, Hoffm. Ill. Mag. iii. p. 202 (1804).
Hesperia lefebvrii, Ramb. Cat. Lép. And. p. 90, note (1858).
Pamphila nostrodamus, Kirby, Syn. Cat. p. 598 (1871).
Hesperia nostrodamus, Staud. Cat. d. Lép. p. 35 (1871).
Gegenes nostrodamus, Wats. P. Z. S. 1893, p. 104.
(For full synonymy consult works on European species.)
Hab. Mediterranean coasts of North Africa.

201. G. HOTTENTOTA, Latr.

? ♀. *Papilio niso*, Linn. Mus. Ulr. Reg. p. 339 (1764); Syst. Nat. i. 2, p. 796 (1767).
♂. *Hesperia hottentota*, Latr. Encyc. Méth. vol. ix. p. 777 (1823).
Hesperia letterstedti, Wallgr. K. Sv. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 49.
Pamphila letterstedti, Trim. Rhop. Afr. Austr. vol. ii. p. 300 (1866).
Pamphila hottentota, Staud. Exot. Schmett. vol. i. pl. 99 (1888).
Pamphila hottentota, Trim. S. Afr. Butt. vol. iii. p. 314 (1889).
Gegenes hottentota, Wats. P. Z. S. 1893, p. 104.
♀. *Thymelicus brevicornis*, Ploetz, S. E. Z. vol. xlv. p. 290 (1884).
Hab. Southern and Western Africa as far north as Senegambia.

I follow Mr. Trimen in disregarding the somewhat forcible plea of Prof. Aurivillius for the identification of Latreille's species with the *Papilio niso* of Linnæus, and the substitution of the latter name. The copies of Clerck's figures given by Prof. Aurivillius do not carry conviction with them. They may apply to several other obscure African forms as well as to the species named by Latreille, and the description given by Linnæus is wholly inadequate. We shall for ever be in the dark as to the species intended by Linnæus. The identification defended so learnedly by Prof. Aurivillius lacks altogether that positiveness which in such a case is essential, and is at best merely opinionative. In letters and orally Mons. Mabille has stoutly maintained to me the identity of Latreille's species *H. hottentota* with the species recently described by Mr. Trimen under the name *obumbrata* (see p. 59). The females of *G. obumbrata* are positively undistinguishable from the females of *G. hottentota*, and I am inclined to think that the form characterized by Mr. Trimen is a dimorphic variety. Typical males of *G. hottentota* and males of the form *obumbrata* are found in my collection, having been taken on the same day and in the same locality *in coitu* with

females which are absolutely inseparable from females of *G. hottentota* received from Mr. Trimen and taken at the Cape. It is worthy of note that all specimens of *G. hottentota* taken in Angola and northward, so far as they have come under my observation (I have seen several hundreds of specimens from various localities), are prevalently smaller than specimens from the Cape.

202. G. OBUMBRATA, Trim.

Pamphila obumbrata, Trim. P. Z. S. 1891, p. 103, pl. ix. fig. 23, ♂.

Hab. Angola, Gaboon, Liberia, and tropical West Coast of Africa generally.

This species is excessively common about Gaboon, and, as I have remarked under *G. hottentota*, appears to be a dimorphic form of that species. Typical *hottentota* occurs in company with it at the same places, and the females are absolutely indistinguishable.

203. G. ALBIGUTTA, Mab.

Pamphila albigutta, Mab. Grandid. Madgr. vol. xviii. p. 357 pl. liv. figs. 2, 2 *a* (1887).

Hab. Madagascar, Natal (*in coll. Staudinger*).

The specimen labelled *P. albigutta* by Mabille in the Staudinger collection is from Natal. It is badly rubbed and worn, but shows likeness to my *subochracea* (see p. 56). It is doubtfully the insect figured in Grandidier's 'Madagascar.'

204. G. (?) GAMBICA, Mab.

Pamphila gambica, Mab. Pet. Nouv. Ent. vol. ii. p. 233 (1878).

Hab. Senegambia.

I place this species here without any knowledge of it other than that derived from the description, in which the author states that it is very near *G. hottentota*, Latr.

205. G. (?) OCCULTA, Trim.

Pamphila occulta, Trim. P. Z. S. 1891, p. 103.

Hab. South-western Africa, Transvaal.

I place this species here provisionally. Mr. Trimen states that it is allied in some respects to *G. hottentota*, but fails to describe the antennæ and palpi, without a knowledge of which the generic location must be temporarily doubtful. It may turn out to be a *Parnara* or a *Baoris*.

PADRAONA, Moore.

206. P. ZENO, Trim. (Plate III. fig. 6.)

Pamphila zeno, Trim. Trans. Ent. Soc. Lond. (3) vol. ii. p. 179 (1864); Rhop. Afr. Austr. vol. ii. p. 301 (1866); S. Afr. Butt. vol. iii. p. 313, pl. xii. fig. 2 (1889).

Pamphila splendens, Mab. Pet. Nouv. Ent. vol. ii. p. 114 (1877).

Padraona watsoni, Butl. P. Z. S. 1893, p. 671.

Hab. South Africa, British Central Africa, Somaliland (*in. coll. Holland*).

I have in my possession most beautifully executed drawings of the male and female of the insect recently described by my valued friend Mr. Butler as *Padraona watsoni*, but I am utterly unable to detect any differences of specific value between this form and typical specimens of *P. zeno* which I have received from Mr. Trimen.

A specimen of *Pamphila splendens*, Mab., so labelled by the late Mr. Hewitson, which is found in Dr. Staudinger's collection, confirms the view I had reached by the study of Mabille's description that it is the same as *P. zeno*, Trimen.

207. P. (?) COLATTUS, Ploetz.

Apaustus collatus, Ploetz, Berl. Ent. Zeit. vol. xxix. p. 229.

Hab. Delagoa.

This species is known to me only by the copy of the figure of Ploetz, which I have been permitted to examine through the courtesy of Mons. Mabille. Judging from this representation, it is a not distant ally of *P. zeno*, Trimen, differing principally in the narrower fulvous markings of the upperside, and the darker colour of the underside of the wings, which in the drawing are quite black except at the base of the wings. The fulvous spots stand out in bold contrast upon this dark ground.

CHAPRA, Moore.

208. C. MATHIAS, Fabr.

Hesperia mathias, Fabr. Ent. Syst. Suppl. p. 433 (1798); Latr. Enc. Méth. vol. ix. p. 751 (1823).

? *Celænorrhinus thrax*, Hübn. Samml. aussereur. Schmett. (1816–1841).

Hesperia havei, Boisd. Faune Ent. Madgr. p. 64 (1833).

Hesperia insconspicua, Bert. Mem. Acad. Sci. Bologna (1849–50), p. 15, pl. i. figs. 4, 5.

Hesperia thrax, Ledr. Verh. zool.-bot. Ges. Wien, vol. v. pl. iv. figs. 9, 10 (1855).

Hesperia mahopaani, Wallgr. K. Sv. Vet.-Akad. Handl. (1857); Lep. Rhop. Caffr. p. 48 (1857).

Pamphila micipsa, Trim. Trans. Ent. Soc. Lond. (3) vol. i. p. 290 (1862).

Pamphila mohopaani, Trim. Rhop. Afr. Austr. vol. ii. p. 304 (1866).

Epargyreus mathias, Butl. Cat. Fabr. Diurn. Lep. p. 275, pl. iii. fig. 8 (1870).

Pamphila elegans, Mab. Bull. Soc. Zool. France, p. 232 (1877).

Chapra mathias, Moore, Lep. Ceylon, vol. i. p. 169, pl. 70. figs. 1, 1 *a* (1880–81).

? *Pamphila ibara*, Ploetz, S. E. Z. vol. xliv. p. 38 (1883).

Pamphila octo-fenestrata, Saalm. Lep. von Madagascar, p. 108 (1884).

Pamphila mathias, var. *elegans*, Mab. Grandid. Madgr. vol. xviii. p. 356, pl. lv. figs. 4, 4 *a*, 5 (1887).

Pamphila mohopaani, Trim. S. Afr. Butt. vol. iii. p. 324 (1889).

Pamphila insconspicua, Butl. P. Z. S. 1893, p. 672; Trim. P. Z. S. 1894, p. 76.

Hab. Africa south of the Sahara, Madagascar, and adjacent islands.

After a very full and thorough study of a great collection of specimens in my possession, coming from all parts of the African continent, including examples from Abyssinia, Zanzibar, the Cape Colony, Angola, Gaboon, and Sierra Leone, and after a diligent comparison with long series before me coming from various parts of continental Asia and the adjacent islands, I am forced to the conclusion, which has already been cautiously maintained by others, that the African insect commonly labelled in collections as *mohopaani*, Wallgr., is identical with the insect named *mathias* by Fabricius. The differences which exist are in most cases merely differences of size, and without locality-labels to show whence the particular specimens come from it would be impossible to distinguish them. The specimens from the region of the Cape are generally a little larger than Indian examples, but I have not a few specimens among the three or four hundred examples of the African forms before me as I write which are as small as any I have from India.

Indeed *C. lodra*, Ploetz, which Mons. Mabille maintains, in his correspondence with me, to be simply a small form of *C. mathias*, is smaller than any Indian examples I have in my possession. I do not, however, quite agree with Mons. Mabille in his view, and prefer to still maintain *lodra* in this catalogue as a distinct species (*v. infra*).

209. C. LODRA, Ploetz.

Pamphila lodra, Ploetz, S. E. Z. vol. xl. p. 355 (1879), vol. xliv. p. 45 (1884).

Hab. Tropical West Africa (Gaboon, Cameroons).

This is a diminutive reproduction at first sight of *C. mathias*, Fabr., but while the markings are exactly the same as in that species, it may be easily and invariably separated by attending to the fact not only that it is so small, but that the fringes are pure white, and the undersides of both the primaries and secondaries are dark hoary greyish brown. It may be that this form is, as has been suggested, a mere variety or local race of *C. mathias*, but until we know more about the facts I hesitate to sink the name of Ploetz as a synonym.

210. C. SINNIS, Mab.

Pamphila sinnis, Mab. Pet. Nouv. Ent. vol. ii. p. 285 (1878).
Hesperia weymeri, Saalm. Lep. von Madagascar, p. 107 (1884).
Pamphila sinnis, Mab. Grandid. Madgr. vol. xviii. p. 361 pl. lv. figs. 1, 2, 2 *a* (1887).
Pamphila albirostris, Grand. Madgr. vol. xviii. p. 361 (1887), pl. lvi. *a*. figs. 4, 4 *a* (plate not published at date of June 1st, 1895).
Hab. Madagascar.

I have the type of *P. albirostris* before me: it is the male of *C. sinnis*, Mab. The characteristic sexual brand on the primaries shows that the insect is a true *Chapra*.

211. C. WAMBO, Ploetz.

Hesperia wambo, Ploetz, S. E. Z. vol. xlvii. p. 97 (1886).
Hab. Africa (*Ploetz*).

From the description this species would appear to be closely allied to *mathias*, Fabr. The description is not definite enough to base any very exact conclusions upon it.

PARNARA, Moore.

I have brought together into this genus an assemblage of species which are very closely related structurally, and seem to me to be more properly assigned to *Parnara* than to any other existing genus. At the same time, it is proper to observe that this arrangement is in some respects merely tentative. In several cases the species depart somewhat widely from the type, yet I am not prepared on this account to separate them, and set up new genera for their reception.

212. P. BORBONICA, Boisd.

Hesperia borbonica, Boisd. Faune Ent. Madgr. p. 65, pl. ix. figs. 5, 6 (1833).
Hesperia fatuellus, Wallgr. (nec Hopff.) K. Sv. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 48 (1857).
Pamphila borbonica, Trim. (part) Rhop. Afr. Austr. vol. ii. p. 303 (1866); Mabille, Grandid. Madgr. vol. xviii. p. 360, pl. lv. figs. 6, 6 *a* (1887); Trim. S. Afr. Butt. vol. iii. p. 322 (1889).
Hab. South Africa, Tropical Africa, both East and West, and the adjacent islands.

This species is very common at Gaboon and at Cameroons.

213. P. GEMELLA, Mab.

Pamphila gemella, Mab. C. R. Soc. Ent. Belg. vol. xxviii. p. clxxxvii (1884).
Hesperia ellipsis, Saalm. Lepidopt. von Madagascar, p. 109 (1884).
Pamphila gemella, Mab. Grandid. Madagascar, vol. xviii. p. 359.
Gegenes gemella, Mab. l. c. pl. lv. figs. 7, 7*a* (1887).
Hab. Madagascar; Seychelles (*Abbott*).

214. P. POUTIERI, Boisd.

Hesperia poutieri, Boisd. Faune Ent. Madgr. p. 65 (1833).
Pamphila poutieri, Mab. Grandid. Madagascar, vol. xviii. p. 363.
Gegenes poutieri, Mab. l. c. pl. lv. figs. 8, 8 *a*, 9, 9 *a* (1887).
Hab. Madagascar; Seychelles (*Abbott*).

215. P. DETECTA, Trim.

Pamphila detecta, Trim. Trans. Ent. Soc. Lond. vol. xli. p. 141, pl. viii. fig. 12 (1893).
Pamphila fallatus, Mab. MS.
Hab. Natal (*Trimen*); Cameroons.
I have several specimens of this species which were taken at Batanga, Cameroons, by the late Dr. A. C. Good. The insect laballed *Pamphila fallatus* in the Staudinger collection by Mons. Mabille, of which I can find no published description, is the same.

216. P. SUBOCHRACEA, sp. nov. (Plate IV. fig. 11.)

♂. Head, thorax, and abdomen fuscous, clothed with greenish hairs. Underside of palpi, thorax, and abdomen pale greenish ochraceous. The primaries and secondaries on the upperside are dark brown, with a slightly purplish lustre toward the outer margin. The costa and the inner margin near the base of both wings are clothed with greenish hairs. There is a minute elongated translucent white spot in the cell on its upper margin toward its extremity. There are two minute subapical spots beyond the end of the cell. There are three discal spots on intervals 2, 3, and 4 below and beyond the cell, the spot on interval 4 being minute, the spots on intervals 3 and 2 being subhastate, the latter the largest. All these spots are translucent. On the secondaries beyond the end of the cell are three small subhastate semi-transparent discal spots, pale in colour. On the lower side the primaries are dark brown on the cell and beyond it on the disc on intervals 2, 3, and 4. The inner margin is fuscous grey. The costa and the apical area are tawny ochraceous. The secondaries are uniformly tawny ochraceous, marked with a dark spot at the end of the cell and a discal series of dark spots accentuating the outer extremity of the three limbal spots beyond the end of the cell. The cilia are pale ochraceous both on the upper and under side. All the spots of the upper surface reappear on the lower side in both wings, but less distinctly defined than on the upper surface. Expanse 31 mm.
Hab. Valley of the Ogové.

217. P. MICANS, sp. nov. (Plate III. fig. 19.)

♂. Head, thorax, and abdomen bright Mars-brown. Underside of abdomen pale ochraceous. The primaries aud the secondaries are bright Mars-brown, with the costal margin of the secondaries dark brown. There are two minute subapical spots in the usual

position, and below and beyond the cell two discal spots, subquadrate in form, on either side of vein 3 near its origin. The lower of these spots is the larger. They are both translucent and waxy yellow in colour. There are two small obscure semi-transparent spots of like colour on the secondaries on either side of vein 3 a little beyond its origin. The margin is slightly darker brown than the body of the wing, and the fringes are paler. On the underside the wings are uniformly pale reddish ochraceous, except the inner margin of the primaries, which is darker, inclining to plumbeous. The spots of the upper surface reappear on the lower side, but far less distinctly defined. Expanse 30 mm.

Hab. Valley of the Ogové.

This very distinct species is represented in my collection by a single specimen.

218. P. (?) URSULA, sp. nov. (Plate II. fig. 4.)

♂. This insect is obscurely brown all over, without any spots or markings whatever.

♀. The female is coloured like the male, but has three elongated subapical spots in the usual position, and two obscure translucent spots on either side of vein 3 of the primaries a little before its origin. The spots are subquadrate.

Expanse, ♂ 26 mm., ♀ 30 mm.

Hab. East Africa.

The types of the males are found in my collection and in the collection of Dr. Staudinger. The only female I have ever seen is contained in the collection of Dr. Staudinger. I refer this insect with some measure of doubt to the genus *Parnara*, with which it in the main agrees in neuration as far as I have been able to ascertain. The insect, however, is not so robust as the other species referred to this genus. The primaries are more rounded on the outer margin and the secondaries somewhat more excavated before the anal angle, in the case of the female. I cannot, however, with the material before me, venture to separate this species from the genus *Parnara*.

SEMALEA, gen. nov.

Antennæ and palpi as in the genus *Baoris*. Primaries: cell about half the length of the wing; vein 5 much nearer 4 than 6; vein 12 terminating on the costa before the end of the cell; vein 7 slightly before the end of the cell; vein 2 one-third of the distance from the base; vein 3 a little before the end of the cell. Secondaries: cell short; vein 5 wanting; discocellulars faint, erect; vein 7 originating well before the end of the cell; vein 3 a little before the end of the cell; vein 2 originating beyond the middle of the cell; the outer margin evenly rounded; the costa slightly produced before the base. The two species referred to this genus are characterized by peculiar sexual markings. In the case of the male of *S. pulvina*, Ploetz, the type of the genus, there

is a broad patch of long silky hairs upon the upper surface of the secondaries at the end of the cell, almost entirely covering the cell and the origin of the median nervules. In addition, on the underside of the primaries there is a broad patch of modified scales, and the inner margin has a fringe of long hairs, which, ordinarily,

Neuration of *Semalea pulvina*, Ploetz. ♀.
a. Underside of primary; *b*. Upperside of secondary.

are folded back upon the under surface of the primaries. In *S. nox*, Mab., the patch of scales on the upper surface of the secondaries is wanting, but upon the primaries on the upper surface there is a broad oval sexual band at the origin of vein 2 below the cell.

Type *S pulvina*, Ploetz.

I have brought these two species together, because of the absolute identity of their neuration and the structure of their palpi and antennæ, and in spite of the wide divergence in the sexual stigmata. At first glance, without a microscopic examination, the two insects look wonderfully alike. There is, however, a remarkable divergence in the sexual stigmata as indicated above. I am, however, more and more inclined to the belief that sexual stigmata cannot be always accepted as the basis of generic subdivisions, in which opinion I know I differ from some authors.

219. S. PULVINA, Ploetz. (Plate II. fig. 14.)

Hesperia pulvina, Ploetz, S. E. Z. vol. xl. p. 353 (1879).
Trichosemeia pulvina, Wats. P. Z. S. 1893, p. 53.
Cobalus carbo, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. clxix (1889).

Hab. Aburi (*Ploetz*); Gaboon (*Good*); Sierra Leone (*Mabille*).

I do not agree with Lieut. Watson in placing this species in my genus *Trichosemeia*. The broad patch of velvety scales upon the upper surface of the secondaries is the principal point of resemblance between this species and the type of the genus. In the form of the wings and the antennæ and the structure of the legs it differs. The female is without the velvety area on the second-

aries, and, I strongly suspect, is the insect described by M. Mabille as *Cobalus atrio* (*cf.* genus *Cobalus*). A figure of *C. atrio*, lent me by the author, heightens the probability of this supposition, but without the type before me I will not attempt to express a positive opinion. The insect in the Staudinger collection labelled *Cobalus carbo* in the handwriting of Mons. Mabille is a normal specimen of *S. pulvina*, Ploetz, ♂.

220. S. NOX, Mab. (Plate IV. fig. 20.)

Pamphila nox, Mab. C. R. Soc. Ent. Belg. 1891, p. clxviii.

Hab. Lagos (*Mabille*); Gaboon (*Good*).

This species is apparently very abundant in the valley of the Ogové. I have a large series of specimens.

BAORIS, Moore.

221. B. FATUELLUS, Hopff.

Pamphila fatuellus, Hopff. Monatsber. k. Akad. Wissensch. Berl. 1855, p. 643; Hopff. Peters' Reise n. Mossamb., Ins. p. 417, pl. xxvii. figs. 3, 4 (1862).

Pamphila borbonica, Trim. (part.) Rhop. Afr. Austr. vol. ii. pp. 303, 304 (1866).

Hesperia caffraria, Ploetz, S. E. Z. vol. xliv. p. 43 (1883).

Pamphila fatuellus, Trim. S. Afr. Butt. vol. iii. p. 323 (1889).

Pamphila cinerea, Mab. MS.

Hab. Natal, Zanzibar, Gaboon, Cameroons.

This species is very common at Gaboon, and, I think, has generally been confounded with *P. borbonica*, from which, however, it may well be separated, as pointed out by Mr. Trimen. A worn female in the Staudinger collection has been labelled *Pamphila cinerea* by Mons. Mabille.

222. B. MARCHALII, Boisd.

Hesperia marchalii, Boisd. Faune Ent. de Madgr. p. 66 (1833).

Pamphila marchalii, Mab., Grandid. Madagascar, vol. xviii. p. 362, pl. lv. figs. 3, 3 *a* (1887).

Hab. Madagascar.

Both from the figure and the description I am inclined to think that this species is very near to, if not identical with, *P. fatuellus*, Hopff., in which case Boisduval's name has priority.

223. B. LUGENS, Hopff.

Pamphila lugens, Hopff. Monatsber. k. Akad. Wissensch. Berl. 1855, p. 643; Peters' Reise n. Mossamb., Ins. p. 418, pl. xxvii. figs. 5, 6 (1862); Trim. S. Afr. Butt. vol. iii. p. 318 (1889).

Halpe lugens, Butl. P. Z. S. 1893, p. 673.

Hab. Delagoa Bay, East Tropical Africa.

The genus *Halpe* is not represented in Africa, and Dr. Butler's reference of this species to that genus is in error.

224. B. ILIAS, Ploetz. (Plate V. fig. 17.)

Hesperia ilias, Ploetz, S. E. Z. vol. xl. p. 355 (1879).

Hab. Guinea (*Ploetz*); Gaboon.

What I take to be the *Hesperia ilias* of Ploetz—forming my conclusion from the description of the species given by the author and from a copy of his unpublished drawing of the same—is the insect figured on the Plate. It comes nearer meeting the requirements alike of description and of figure than any other West-African species known to me in nature.

225. B. XYLOS, Mab. (Plate II. fig. 13.)

Pamphila xylos, Mab. Ann. Soc. Ent. France, (6) vol. x. p. 31, pl. iii. fig. 8 (1890).

Hab. Gaboon, Cameroons, Sierra Leone.

Mons. Mabille (*l. c.*) states that he has sufficiently characterized this species in the 'Bulletin' of the preceding year, and contents himself therefore with a figure. By reference to the 'Bulletin' for 1889, I discover that his memory was at fault. He did not describe *P. xylos* in the 'Bulletin' of the year before. Our only knowledge of the species, therefore, must be derived from the figure given in the plate, which, fortunately, is quite recognizable. It represents a damaged male of a species which is quite common on the tropical western coast of Africa. I have a long series of specimens in which, singularly enough, the females are more numerous than the males. The figure given by Mons. Mabille is that of a male minus the abdomen. The female which is represented in the plate does not differ materially in the location and style of the marking from the male, but is generally much larger. I discovered that Mons. Mabille had mingled with this species, in his collection and that of Dr. Staudinger, specimens of the following species, which is abundantly distinct, though presenting a superficial likeness.

226. B. ALBERTI, sp. nov. (Plate II. fig. 21.)

♂. Body and appendages black. Abdomen produced beyond the anal angle of the secondaries. The wings on the upperside are black, with whitish fringes, those of the primaries checkered with black at the ends of the nervules. There are no spots on the secondaries. The primaries are ornamented with three small subapical spots in the usual position, by two large and conspicuous subquadrate spots, one on either side of vein 3 at its origin, the upper one being the smaller of the two. In many specimens there is also a small and faint spot on cell 1, just below the large subquadrate spot on cell 2. On the underside, the wings are marked precisely as on the upperside, save that the inner margin of the primaries is pale, and in some specimens there are traces of an obsolete series of pale submarginal markings on the secondaries.

♀. The female is marked like the male, save that on the under-

side there is a well-defined row of pale submarginal markings on the primaries, and a less well-defined series of similar markings on the secondaries. The wings in this sex are broader, more rounded, and less produced at the apex of the primaries than in the male, and the abdomen is stouter and shorter than in that sex, not reaching beyond the anal angle of the secondaries.

Expanse, ♂ 26–29 mm., ♀ 32–34 mm.

Hab. Valley of the Ogové, Cameroons, Sierra Leone.

I name this species in honour of my little friend Albert Good, the only child of Dr. A. C. Good, one of the heroes of the Dark Continent, whose death last November, a few days after his return from a long and trying journey into the interior of the Cameroons, has filled the hearts of a host of friends and admirers with profound sorrow. "Bertie," though not yet in his teens, is represented in my collections by numerous specimens taken by his own hands, and is no doubt the youngest entomologist who has thus far collected amidst the jungles of "Gorilla-land."

227. B. ARELA, Mab. (Plate II. fig. 20.)

Hypoleucis arela, Mab. C. R. Soc. Ent. Belg. 1891, p. lxix.

Hab. Gaboon, Ogové Valley.

This species, for the identification of which in my collection I am indebted to Mons. Mabille, is quite common about Gaboon. Mons. Mabille had affixed the name *atimus* to several specimens of this species in his collection at the time I visited him. They were undoubtedly *arela*.

228. B. ARGYRODES, Holl.

Parnara argyrodes, Holl. Ent. News, vol. v. p. 93, pl. iii. fig. 11 (1894).

Hab. Valley of the Ogové.

229. B. MABEA, Holl.

Parnara mabea, Holl. Ent. News, vol. v. p. 92, pl. iii. fig. 12 (1894).

Hab. Valley of the Ogové.

230. B. LEUCOPHÆA, Holl.

Parnara leucophæa, Holl. Ent. News, vol. v. p. 93, pl. iii. fig. 14 (1894).

Hab. Valley of the Ogové.

231. B. UNISTRIGA, Holl.

Parnara unistriga, Holl. Ent. News, vol. v. p. 30, pl. i. figs. 13, 14 (1894).

Hab. Valley of the Ogové.

232. B. MELPHIS, Holl.

Parnara melphis, Holl. Ent. News, 1894, p. 31, pl. i. fig. 18.

Hab. Valley of the Ogové.

233. B. MALTHINA, Hew.

Hesperia malthina, Hew. Ann. & Mag. Nat. Hist. (4) vol. xviii. p. 457 (1876).

Pamphila euryspila, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. clxxix (1891).

Proteides euryspila, Mab. Novit. Lepidopt. p. 117, pl. xvi. fig. 5 (1893).

Hab. Sierra Leone (*Mabille*); Gaboon (*Good*).

The only specimen of the female which I have ever seen is contained in my collection, and was taken at Batanga, Cameroons. It does not differ materially from the male, save that there is an additional translucent spot upon the fore wing in cell 1, and the large white spot on the underside of the secondaries is much larger than in the male, extending farther outwardly and inwardly.

234. B. STATIRA, Mab.

Pamphila statira, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. clxxx (1891); Novit. Lepidopt. p. 114, pl. xvi. fig. 2 (1893).

♂. The type of this species was a female contained in the collection of Dr. Staudinger. The collection also contains a male, which differs from the female on the upperside in lacking the spot in the cell of the primaries, and in having, in the example before me, the uppermost of the three subapical spots obsolete. In the secondaries, the spots at the end of the cell which are conspicuous in the female on the underside and faintly appear on the upperside are also lacking, and the discal spots are somewhat smaller than in the female.

Hab. French Congo (*Mocquerys*).

235. B. STATIRIDES, sp. nov. (Plate V. fig. 6.)

♀. Palpi on the upperside, head, thorax, and abdomen on the upperside black, clothed with fuscous scales. Palpi on the underside whitish; thorax and anal extremity of the abdomen pale fuscous. Primaries black on the upperside, with two widely separated minute elongated spots near the end of the cell, two subapical spots in the usual position, and a discal series of four spots, the lowermost of the series on interval 1 cuneiform, the next on interval 2 subquadrate, and the largest of the series, and the two succeeding ones on intervals 3 and 4, subquadrate, the last smaller than the one preceding it. The secondaries beyond the cell are adorned with a broad irregularly curved white macular band, running from before the end of the cell inwardly and widening to vein 1 *b*. The primaries on the underside are black, with the spots as on the upperside. The secondaries are creamy white, with the outer margin broadly black. There is a con-

spicuous patch of black raised scales situated on interval 1 below the cell, and extending outwardly on either side of vein 2 at its origin. Expanse 34 mm.

Type in collection of Dr. Staudinger.

Hab. Valley of the Ogové (*Mocquerys*).

236. B. NETOPHA, Hew.

Hesperia netopha, Hew. Ann. & Mag. Nat. Hist. (5) vol. i. p. 345 (1878).

Hesperia roncilgonis, Ploetz, S. E. Z. vol. xliii. p. 450 (1882).

Pamphila roncilgonis, Trim. Trans. Ent. Soc. Lond. vol. xli. p. 139, pl. viii. fig. 11 (1893).

Pamphila cojo, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 250, pl. vi. fig. 7 (1893).

Var. NYASSÆ, Hew. (Plate I. fig. 8.)

Hesperia nyassæ, Hew. Ann. & Mag. Nat. Hist. (5) vol. i. p. 345 (1878).

Hab. Natal, Mashonaland, Angola, Gaboon, Cameroons, Togoland.

This is one of the most singularly coloured species of the group. I have a good series of specimens from Gaboon and Cameroons, which agree very well with specimens received from Mr. Trimen, who obtained them from Mr. F. C. Selous, who took them in Manica. The type of *Hesperia nyassæ*, Hew., I think is a female. It is larger and paler on the underside than any specimens I have seen from other localities. I cannot, however, bring myself to believe that it is anything more than a variety of *B. netopha*. It is worthy of note that there is much variation in the ground-colour of the underside of the wings in this species. No two specimens in a series of ten or twelve are exactly of the same shade, and the ground-colour runs from a pale yellowish ochraceous to a pale reddish brown, tinged with pink. The three small subapical spots which appear in a majority of specimens are wanting in others. They are variable.

237. B. MONASI, Trim.

Pamphila monasi, Trim. S. Afr. Butt. vol. iii. p. 317.

Hab. Natal.

238. B. TARACE, Mab.

Pamphila tarace, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. clxxix (1891); Novit. Lepidopt. p. 114, pl. xvi. fig. 1 (1893).

Hab. Sierra Leone.

239. B. SUBNOTATA, Holl.

Parnara (?) *subnotata*, Holl. Ent. News, vol. v. p. 94, pl. iii. fig. 13 (1894).

Pamphila rufipuncta, Mab. MS. in Dr. Staudinger's collection.

Hab. Valley of the Ogové.

240. B. NIVEICORNIS, Ploetz.

Hesperia niveicornis, Ploetz, S. E. Z. vol. xliv. p. 3 (1883).

Hab. Angola.

I only know this species from the figure of Ploetz. It is very remarkably ornamented upon the underside of the wings, and the description given is sufficient to enable its identification.

241. B. (?) NEOBA, Mab.

Pamphila neoba, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. clxxxviii (1891).

Hab. Cameroons (*Mabille*).

I only know this species from the description and the drawing of the type furnished me by Mons. Mabille. It is impossible from either to be sure of the species or its generic location.

242. B. (?) ZEPHORA, Ploetz.

Apaustus zephora, Ploetz, S. E. Z. vol. xlv. p. 156 (1884).

Hab. Angola (*Ploetz*).

I do not know this species save by the description. It does not seem to apply to any of the species known to me in nature.

243. B. (?) BAURI, Ploetz.

Hesperia bauri, Ploetz, S. E. Z. vol. xlvii. p. 98 (1886).

Hab. Aburi.

I do not know this species, and locate it here provisionally.

244. B. (?) MURGA, Mab.

Pamphila murga, Mab. Ann. Soc. Ent. France, (6) vol. x. p. 31 (1890).

Hab. Caffraria (*Mabille*).

Mons. Mabille compares this species with *P. natalensis*, Ploetz. I cannot discover that Ploetz ever published a species under the name of *natalensis*. From the description, the insect seems to be possibly a *Baoris*, but it may be a *Pardaleodes*. I locate it here provisionally, as I am unable to learn anything about it from the author of the species.

245. B. (?) HOLTZII, Ploetz.

Hesperia holtzii, Ploetz, S. E. Z. vol. xliv. p. 43–4 (1883).

Hab. Angola (*Ploetz*).

I can make nothing out of either the description or the figure of Ploetz. The insect represented seems both to myself and to Mons. Mabille to be a possible variety of *C. mathias-mohopaani*. I am, however, very strongly inclined to the opinion that it is the same insect recently described by Mr. Trimen under the name *Pamphila monasi* (q. v.).

246. B. (?) AYRESII, Trim.

Pamphila ayresii, Trim. S. Afr. Butt. vol. iii. p. 321, pl. xii. fig. 1 (1889).

Hab. South Africa; South Tropical Africa.

PLATYLESCHES, gen. nov.

Allied to *Parnara*, Moore. The thorax and head are very broad, and the general appearance of the body is more robust than in *Parnara*. The antennæ are more than half as long as the costa of the primaries, slender, terminating in a stout club, with a strongly recurved hook at its end. The palpi are broad, flattened horizontally, appressed, heavily clothed with long scales upon the first and second joints, and with the third joint (which is minute, acute, and situated on the outer edge of the horizontally widened second joint) naked. The wings are relatively somewhat narrower than in the genus *Parnara*, with the outer margin of the primaries nearly straight, or, as in *P. picanini*, Holl., slightly excavated above the outer angle. The secondaries are more or less lobed at the anal angle in the male. The neuration of the wings does not materially differ from that in *Parnara*, so far as I have been able to determine with the limited material at my disposal.

Type *P. picanini*, Holland.

247. P. PICANINI, Holl.

Parnara (?) *picanini*, Holl. Ent. News, vol. v. p. 91, pl. iii. fig. 9 (1894).

Pamphila grandiplaga, Mab. MS. in Staudinger collection.

Hab. Valley of the Ogové.

248. P. MORITILI, Wallgr.

Hesperia moritili, Wallgr. K. Sv. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 49 (1857).

Pamphila (?) *moritili*, Trim. Rhop. Afr. Austr. vol. ii. p. 305 (1866).

Hesperia neba, Hew. Ann. & Mag. Nat. Hist. (4) vol. xix. p. 84 (1877).

Pamphila moritili, Trim. S. Afr. Butt. vol. iii. p. 319, pl. xii. fig. 4 (1889).

Hab. South Africa; South Tropical Africa.

249. P. GALESA, Hew. (Plate I. fig. 7.)

Pamphila galesa, Hew. Ann. & Mag. Nat. Hist. (4) vol. xix. p. 79 (1877).

Hab. West Africa.

I only know this species from the type, which is preserved in the British Museum. It is a very robust insect, and very closely allied to *H. nigerrima*, Butl.

250. P. NIGERRIMA, Butl. (Plate II. fig. 12.)

Halpe nigerrima, Butl. P. Z. S. 1893, p. 672.

Hab. British Central Africa.

This species is exceedingly close to *P. galesa*, Hew. The only difference I can detect is in the form of the macular band on the upperside of the secondaries, which is more irregularly curved in *galesa* and has a slightly different direction, and in the presence in *nigerrima* of a narrow white costal streak on the underside of the primaries at the base. This last feature seems to be lacking in *galesa*.

251. P. CHAMÆLEON, Mab.

Pamphila chamæleon, Mab. C. R. Soc. Ent. Belg. vol. XXXV. p. clxxix (1891); Novit. Lepidopt. p. 115, pl. xvi. fig. 3 (1893).

Hab. Sierra Leone.

Mons. Mabille compares this species with his *P. grandiplaga*, which in his letter he identifies as my *P. picanini*. *Grandiplaga* is apparently a MS. name. My learned friend is in the habit of affixing names to specimens coming into his possession, and has given them currency now and then in his papers and through collections which he has labelled, without having published a description of the species. This has led to a great deal of bewilderment on my part in several cases and an inordinate consumption of valuable time in quest of the place in literature where the supposed description, which ought to have been published, might be found. Unpublished names of species should not be referred to, except it be with a distinct statement that they are such.

252. P. AMADHU, Mab. (Plate V. fig. 11.)

Pamphila amadhu, Mab. C. R. Soc. Ent. Belg. vol. XXXV. p. clxxviii (1891).

Pamphila heterophyla, Mab. l. c.

Baoris? amadhu, Butl. P. Z. S. 1893, p. 672.

Hab. Transvaal, Natal (*Mabille*); British Central Africa (*Butler*).

I have before me the types of *P. amadhu* and *P. heterophyla*, belonging to Dr. Staudinger, and am satisfied of the identity of the two forms. The type of *P. heterophyla* is simply a dwarfed and somewhat worn example of *P. amadhu*. The insect is closely allied to *P. moritili*.

253. P. BATANGÆ, Holl.

Parnara batangæ, Holl. Ent. News, vol. v. p. 92, pl. iii. fig. 10 (1894).

Hab. Valley of the Ogové.

254. P. NIGRICANS, sp. nov. (Plate II. fig. 15.)

♂. Antennæ black, marked with white before the extremity on

the upperside. The uppersides of the head, thorax, and abdomen are black, with the anal extremity of the abdomen white tipped with a tuft of black hairs. The palpi and the pectus on the lower side are white. The lower side of the thorax is grey. The lower side of the abdomen is black annulated with white. The primaries on the upperside are black. The cilia on the primaries are black marked with white at their extremities near the outer angle. The cilia of the secondaries are white, very conspicuously so near the anal angle. The primaries are marked with two subapical spots in the usual position, two elongated minute spots on the cell near its end, one on its upper margin and one on its lower, and by a transverse discal series of four spots, of which the one on interval 1 is minute and subtriangular, situated on vein 1, the spot on interval 2 is subquadrate, excavated externally, and separated from the other spot in the cell by the median nerve. Beyond this spot on intervals 3 and 4 are two smaller spots. The secondaries are crossed about the middle by an irregularly-curved series of five or six white semi-translucent spots. On the underside, the primaries are black, darkest at the base. There is a fine white costal ray near the base. The spots of the upperside reappear, but less distinct than on the upperside, and above and beyond the spot on interval 1 is a white curved ray uniting on its curved upper margin the two lower spots of the discal series. The secondaries are black, most conspicuously so in the region of the anal angle. The inner margin and the outer margin from the outer angle to the extremity of vein 2 are sprinkled with grey scales, and the nerves are likewise clothed with grey scales, causing them to be picked out distinctly upon the dark background. The white discal series of spots reappears on the underside, the terminal spot of the series located on vein 1*b*, being the most conspicuous, whereas on the upperside it is least conspicuous and appearing as a large triangular white patch.

♀. The female is like the male, but with broader and more rounded wings.

Expanse, ♂ 28 mm., ♀ 30 mm.

Types in coll. Staudinger.

Hab. Freetown (*Preiss*); Gaboon (*Mocquerys*).

The male is labelled in the Staudinger collection *P. leucopyga*, Ploetz, but this determination is wholly in error. *Leucopyga* of Ploetz is an *Acleros* and a wholly different insect. This species is closely related to *P. moritili* and its allies.

Katreus, Wats.

255. K. johnstonii, Butl. (Plate II. fig. 18.)

Astictopterus johnstonii, Butl. P. Z. S. 1887, p. 573.

Katreus johnstonii, Watson, P. Z. S. 1893, p. 115; Holl. Ent. News, Jan. 1894, pl. i. fig. 8.

Hab. Cameroons, Gaboon.

PARDALEODES, Butl.

256. P. EDIPUS, Cram.

♂. *Papilio edipus*, Cram. Pap. Exot. iv. pl. cccLxvi. figs. E, F (1782).

Pardaleodes edipus, Butl. Ent. Mo. Mag. vol. vii. p. 96 (1870); Kirby, Syn. Cat. p. 625 (1871).

Plastingia edipus, Ploetz, S. E. Z. vol. xl. p. 358 (1879), vol. xlv. p. 148 (1884).

Pardaleodes edipus, Watson, P. Z. S. 1893, p. 117.

♀. *Cyclopides sator*, Doubl. & Hew. Gen. Diurn. Lep. pl. lxxix. fig. 4.

Pamphila? sator, Westw. l. c. p. 523 (1852).

Pardaleodes sator, Kirby, Syn. Cat. p. 625 (1871).

Plastingia sator, Ploetz, S. E. Z. vol. xl. p. 358, & vol. xlv. p. 148.

Pardaleodes sator, Watson, P. Z. S. 1893, p. 117.

Hab. Tropical West Africa.

After a very close study of the matter in the light of long series of specimens, consisting of several hundreds of examples, I am satisfied that this is the correct synonymy of this species, which is very closely allied to the next, and with which it has been no doubt, so far as the female of that is concerned, frequently confounded. The crucial test for discriminating between the two species is the fact that in *P. incerta*, Snell., the anterior wings in both sexes show no translucency in the spots above vein 2, whereas in *P. edipus* the spots between veins 2 and 3 and 3 and 4, the spots at the end of the cell, and the three small subapical spots are invariably translucent. By holding the specimens up to the light, it is always possible to decide to which of the two species they belong.

I am at a loss to account for the fact that several authors report the male and the female of both *P. edipus* and *P. sator* to have been contained in collections examined by them. This is done by Ploetz in his paper upon the Lepidoptera collected by Buchholz. So far as my observations extend, every specimen of *P. sator*, correctly determined to be such by comparison with the very good figure given by Doubleday and Hewitson in their work, has been a female. I have seen hundreds of specimens, and many pairs taken *in coitu*, and am sure of this determination.

257. P. INCERTA, Snellen.

♂. *Pamphila incerta*, Snellen, Tijd. voor Entom. 1872, p. 29, pl. 10. figs. 10, 11, 12.

♀. *Hesperia coanza*, Ploetz, S. E. Z. vol. xliv. p. 232 (1883).

Pardaleodes coanza, Watson, P. Z. S. 1893, p. 117.

Hab. Tropical West Africa.

The female of this species resembles the male of the preceding, *P. edipus*, but the point of discrimination enables an easy decision to be made in all cases, as I have already shown.

258. P. HERILUS, Hopff.

Pamphila herilus, Hopff. Monatsber. d. k. Akad. d. Wissensch. Berl. 1855, p. 643; Peters' Reise n. Mossamb., Ins. p. 419, pl. xxvii. figs. 7, 8 (1862).

Hab. Querimba, East Africa (*Hopffer*).

Hopffer states that the types of this species were males. From the figure, I should say that they were females. The figure represents apparently a dwarfed female of *P. edipus*, and closely resembles such which I have from Gaboon.

259. P. REICHENOWI, Ploetz. (Plate III. fig. 18.)

♀. *Plastingia reichenowi*, Ploetz, S. E. Z. vol. xl. p. 357 (1879), vol. xlv. p. 147 (1884).

♂. *Pardaleodes festus*, Mab. Ann. Soc. Ent. France, (6) vol. x. p. 33, pl. iii. fig. 2 (1889).

Hab. Tropical West Africa.

There is not a particle of doubt of the correctness of the above synonymy. I have specimens taken *in coitu* of the male and female of this species. The males have been repeatedly determined for me as *P. festus* by Mons. Mabille, and agree perfectly with the figure he gives. The females agree with Ploetz's type of *P. reichenowi*, which is preserved at the Berlin Museum, and is represented in the plate accompanying this paper.

260. P. XANTHOPEPLUS, Holl. (Plate III. figs. 9 ♂, 16 ♀.)

Pardaleodes xanthopeplus, Holl. Ann. & Mag. N. H. (6) vol. x. p. 289 (1892).

Hab. Valley of the Ogové.

261. P. BULE, sp. nov. (Plate. III. fig. 21, ♂ ♀.)

Allied to *P. reichenowi*, Ploetz = *festus*, Mab.

♂. Primaries deep black, slightly clothed with greenish scales near the base. The wing is marked with eleven spots as follows:—two small oval spots at the end of the cell, one above each other, and above them a minute linear spot; three small oval subapical spots forming a series curving inwardly; a small round spot in interval 4; a triangular spot in interval 3; a large subquadrate spot in interval 2; (these three spots form a transverse series running inwardly towards the margin). The large spot is followed in interval 1 by a triangular orange-yellow spot, diminishing towards the inner margin. There is also an obscure orange-yellow spot in interval 1 towards the base. All the spots are translucent, except the two in interval 1, which are opaque. The secondaries are bright orange-yellow, paler than in *P. festus*, with the costal margin and outer angle broadly black. The cell near the base and the inner margin are clothed with fuscous hairs.

On the underside, the primaries are blackish, the spots of the

upperside reappearing, but pale ochraceous. The costa is, furthermore, laved with pale ochraceous from the base to the region of the subapical spots, and in interval 5 there is a pale ochraceous area, in the middle of which there is a minute white dot circled with blackish. A pale yellowish-grey ray connects the lowermost spot of the discal series with the outer angle. The secondaries are pale ochraceous, with the costa on the inner two-thirds marked with irregular blackish spots. There is a subtriangular blackish spot near the outer angle, a black spot in interval 1 *b* near the cell, and a smaller similar spot surmounted with a V-shaped blackish mark on the same interval near the anal angle. The innermost of these last two blackish spots is supplemented on the side of the base with a small chalky-white spot. There are in addition a number of obscure transverse brownish lines and obscure submarginal hastate markings.

♀. The female is like the male, except that it wholly lacks the markings on interval one in the primaries, and the markings on the underside of the secondaries are not so distinct. The outline of the wings, furthermore, is broader.

Expanse, ♂ ♀ 36 mm.

Hab. Bulé country, Cameroons.

This species may be easily distinguished from *P. reichenowi* by the deeper black of the primaries, the smaller size of the spots, and the fact that none of them are confluent, as in *P. reichenowi*. There is no black border on the inner two-thirds of the secondaries and no yellow spot in the cell of the secondaries, the yellow of the hind wing running almost to the base. A further distinction is the absence of the checkered fringes of the primaries on the upper surface. The fringes are slightly checkered on the underside.

262. P. ASTRAPE, Holl. (Plate IV. fig. 12.)

Pardaleodes astrape, Holl. Ann. & Mag. N. H. (6) vol. x. p. 290 (1892).

Pardaleodes parcus, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 258 (1893).

Hab. Valley of the Ogové (*Good*); Togoland (*Karsch*).

263. P. ARIEL, Mab.

Pamphila ariel, Mab. Pet. Nouv. Entom. vol. ii. p. 285 (1878).

Pardaleodes ariel, Mab. Grandid. Madgr. vol. xviii. p. 340, pl. liii. figs. 10, 10 *a*, 11 (1887).

Hab. Madagascar.

264. P. PUSIELLA, Mab.

Pardaleodes pusiella, Mab. Bull. Soc. Zool. France, 1877, p. 237.

Hab. Landana (*Mabille*).

I cannot find out anything about this species.

265. P. LIGORA, Hew.

Hesperia ligora, Hew. Ann. & Mag. N. H. (4) vol. xviii. p. 450 (1876).

Carystus thersander, Mab. Ann. Soc. Ent. France, (6) vol. x. p. 30, pl. iii. fig. 5 (1890).

Carystus? *thersander*, Holl. Ent. News, vol. v. pl. i. fig. 17 (1894).

Hab. Angola (*Hew.*); Sierra Leone (*Mab.*); Cameroons (*Good*).

After a careful examination of the structure of this species, although it greatly exceeds in size any other species of *Pardaleodes* known to me, and the primaries are more pointed than in the type of the genus, I cannot find anything to justify its separation from *Pardaleodes*. With *P. xanthioides*, Holl., and *P. xanthias*, Mab., it forms a small sub-group in the genus.

266. P. XANTHIAS, Mab. (Plate III. fig. 7.)

Carystus xanthias, Mab. C. R. Soc. Ent. Belg. p. cxvii (1891).

Hab. Lagos (*Mabille*); Gaboon (*Good*).

This species is intermediate between *P. ligora*, Hew., and *P. xanthioides*, Holl.

267. P. XANTHIOIDES, Holl. (Plate IV. fig. 14.)

Pardaleodes xanthioides, Holl. Ann. & Mag. N. H. (6) vol. x. p. 290 (1892).

Hab. Valley of the Ogové.

268. P. VIBIUS, Hew.

Astictopterus vibius, Hew. Ann. & Mag. N. H. (5) vol. i. p. 343 (1878).

Pamphila rega, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. cxlix (1889); Ann. Soc. Ent. France, (6) vol. x. p. 31, pl. iii. fig. 7, ♀ (1890).

Hab. Tropical West Africa.

269. P. SIERRÆ, sp. nov. (Plate IV. fig. 19.)

♂. Allied closely to *P. vibius*, Hew. Instead, however, of having the reddish-orange spot on the primaries defined on the lower margin by vein 1, as in that species, this spot extends to the inner margin and likewise inwardly toward the base, being interrupted at the base by a linear patch of raised scales, extending along the lower edge of the cell at the origin of vein 2. The secondaries also are paler on the upper surface, and are marked beyond the cell by an obscure series of yellowish spots. On the underside the wings are much paler than in *vibius*, the secondaries of which on the underside are uniformly black; in this species they are ochraceous, clouded with fuscous and defined externally by a fine black marginal line. This may be a local form of *vibius*, but is sufficiently distinct to deserve description. Expanse 25 mm.

Type in coll. Staudinger.

Hab. Sierra Leone.

270. P. FAN, Holl.

Osmodes (?) *fan*, Holl. Ent. News, vol. v. p. 91, pl. iii. fig. 8 (1894).

Hab. Interior of Cameroons.

After a very careful microscopical study of the anatomical details of the structure of the three preceding species, I can find nothing of generic value to lead me to separate them from the species included in the genus *Pardaleodes*, though in general appearance they present widely different features. The total absence of translucent spots on the primaries, the broader and more rounded character of the wings, and the general style of the markings at first sight appear to reveal such a difference as to have led me for some time to have been inclined to refer these species to the genus *Koruthaialos*, Wats., but the palpi, the neuration, and the antennæ are so exactly in agreement with those of the genus *Pardaleodes*, that I am constrained, in spite of the facies, to place them in the latter genus.

CERATRICHIA, Butl.

271. C. NOTHUS, Fabr.

Papilio nothus, Fabr. Mant. Ins. ii. p. 88 (1787).

Ceratrichia nothus, Butl. Cat. Fabr. Diurn. Lep. pl. iii. fig. 15 (1870); Watson, P. Z. S. 1893, p. 117.

Hab. Tropical West Africa.

This species is not nearly so common as the two following.

272. C. PHOCION, Fabr.

Papilio phocion, Fabr. Spec. Ins. ii. p. 138 (1781).

Ceratrichia phocion, Butl. Cat. Fabr. Diurn. Lep. pl. iii. fig. 14 (1870).

Cyclopides phocœus, Westw., Doubl. & Hew. Gen. Diurn. Lep. p. 251 (1852).

Ceratrichia semilutea, Mabille, C. R. Soc. Ent. Belg. 1891, p. lxv.

Hab. Tropical West Africa.

This species appears to be very common on the Ogové. The female has the primaries profusely spotted in some specimens, and the secondaries more or less suffused with brown, almost obscuring the broad yellow middle area. *Ceratrichia semilutea*, Mab., the type of which is before me as I write, is a slightly dwarfed specimen of the male. Another male, in the Staudinger collection, has been designated as the type of an unpublished species by Mons. Mabille, to which he gives the MS. name *C. punctata*. It is a male with the primaries more spotted than is quite usual, though in a long series of specimens, such as I possess, numerous examples of this form are sure to be found.

273. C. FLAVA, Hew. (Plate III. fig. 14.)

♂. *Ceratrichia flava*, Hew. Ann. & Mag. Nat. Hist. (5) vol. i. p. 343 (1878).

Plastingia charita, Ploetz, S. E. Z. vol. xl. p. 356 (1879).

♀. *Apaustus argyrosticta*, Ploetz, S. E. Z. vol. xl. p. 358 (1879); id. ibid. vol. xlv. p. 156 (1884); id. l. c. *A. argyrospila*, Ploetz, MS.

Ceratrichia argyrosticta, Wats. P. Z. S. 1893, p. 117.

Hab. Cameroons, Valley of the Ogové, Aburi (*Ploetz*).

This is a very common species. I have an enormous series, taken at different times and places. There is not a shadow of doubt in my mind that the above synonymy is correct. The females are very variable upon the upperside of the wings, but agree very well with the males on the underside, though in both the male and the female sex the silvery centres of the spots on the underside are often suffused with dark brown, and the silvery colour is rendered obsolete.

Cobalus, Hübn.

274. C. (?) corvinus, Mab.

Cobalus corvinus, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. clxix (1889).

Hab. Sierra Leone (*Mabille*).

I allow this species to remain in this genus, to which it has been assigned by its author, though it is quite plain to me that it does not really belong here. I have the type before me as I write, but as it is unique and in poor condition, so that I cannot without great risk of further injury make a close anatomical investigation, I must leave its location undecided. It seems superficially to show a general relationship to *pulvina*, Ploetz, and *nox*, Mab., but the wings are more fragile and relatively longer, and the insect is not so robust.

275. C. (?) atrio, Mab.

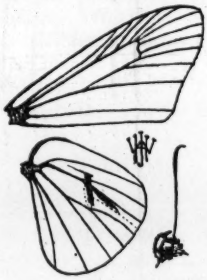
Cobalus atrio, Mab. C. R. Soc. Ent. Belg. 1891, p. lxxxii.

A figure of the type kindly lent me by Mons. Mabille suggests that this is the female of *Semalea pulvina*, Ploetz (*q. v.*). It is certainly not a *Cobalus*, as that genus is South-American.

Andronymus, gen. nov.

Antennæ more than half the length of the primaries, slender; club moderate, fusiform, slightly recurved at the tip. Palpi divergent, with the first and second joints heavily clothed with scales, the third joint naked, aciculate, erect, as high as the vertex of the head. Fore wing elongated, with the inner margin considerably longer than the outer margin, blunt at the apex, and slightly excavated between the extremities of veins 1 and 3. Cell narrow, elongated, nearly two-thirds the length of the costa; vein 12 reaching the costa before the end of the cell; upper discocellular short, but distinct, at right angles to the upper margin of cell; middle discocellular relatively long, curved inwardly; lower disco-

cellular short, forming an obtuse angle with the lower margin of the cell; lower margin of cell slightly bent outwardly at origin of vein 2, which is located near the middle of the cell. Vein 3 nearer to vein 4 than to vein 2. Hind wing with costal margin nearly straight; outer margin and inner margin rounded; outer and anal angles broadly rounded. On the upperside of the wing, on the middle of the fold between veins 7 and 8 near the origin of vein 7, is a small pencil of long hairs, and vein 6 just beyond the end of



Neuration of *Andronymus philander*, Ploetz. ½.

the cell is clothed on the underside with a closely appressed bunch of thick hair-like scales. Discocellulars and vein 5 very faint, if not quite obsolete. The wings are marked with translucent spots, those on the primaries being located in the usual order, those on the secondaries being four in number—a large one at the end of the cell, and three just below it, one between the origins of veins 2 and 3, and one on either side of this spot, separated from the central spot by veins 2 and 3. Hind tibiæ with two pairs of spurs.

Type *A. philander*, Ploetz.

276. A. PHILANDER, Hopff.

Pamphila philander, Hopff. Monatsb. Akad. Wiss. Berl. 1855, p. 643; Peters' Reise n. Mossamb., Zool. v. p. 416, pl. xxvii. figs. 1, 2 (1862).

Carystus philander, Kirby, Syn. Cat. p. 590 (1871).

Acleros philander, Butl. P. Z. S. 1893, p. 669.

Ancyloxypha philander, Trim. P. Z. S. 1894, p. 78.

Carystus evander, Mab. Ann. Soc. Ent. France, (6) vol. x. p. 30, pl. iii. fig. 4 (1890).

Hab. Tropical Western and Central Africa.

277. A. LEANDER, Ploetz.

Apaustus leander, Ploetz, S. E. Z. vol. xl. p. 360 (1879).

Hab. Tropical Western Africa.

This species may be readily distinguished from *A. leander*, its

very near ally, by the yellow colour of the light markings upon the wings.

278. A. NEANDER, Ploetz. (Plate II. fig. 23.)

Apaustus neander, Ploetz, S. E. Z. vol. xlv. p. 154 (1884).

Ancyloxypha producta, Trim. S. Afr. Butt. vol. iii. p. 334 (1889).

Hab. Tropical West Africa; Delagoa.

I have a long series of this species, concerning which Mr. Good wrote me that at the time of capture they appeared to be engaged in migrating in vast numbers. Only upon the occasion of this migration did he observe them during a residence of eight years upon the banks of the Ogové River. Mr. Trimen confirms, after examining specimens I sent him, the opinion I had before communicated to him, that this species is the one named *producta* by him.

HIDARI, Dist.

279. H. CÆNIRA, Hew. (Plate II. fig. 3.)

Hesperia cænira, Hew. Exot. Butt. vol. iv. *Hesperia*, pl. ii. figs. 15, 16 (1867).

Pamphila cænira, Kirby, Syn. Cat. p. 606 (1871).

♀. *Hesperia calpis*, Ploetz, S. E. Z. vol. xl. p. 354 (1879), vol. xliii. p. 328 (1882).

Hab. Gaboon, Cameroons.

The description given by Ploetz of his species named *Hesperia calpis* is unmistakable, if care be taken to make the comparisons which he suggests. I have also been able to identify his species by means of a copy of the figure contained in his plates. For many years I have kept *H. calpis* apart from the older species named *Hesperia cænira* by Hewitson, but upon examination I discover that every specimen of *H. calpis* in my collection, several dozens of them, are females, and all of the specimens of typical *H. cænira* are males. Furthermore, there is such absolute agreement in the markings and coloration of the primaries on the underside of the two forms, as to convince me that they are sexes, and I have accordingly united them as above. The female varies in some instances. I have one specimen in which there is a manifest tendency to an enlargement of the white spot on the primaries, so that the marking approximates more nearly that of the male than is usual.

280. H. LATERCULUS, Holl. (Plate I. fig. 15.)

Proteides laterculus, Holl. Ent. News, vol. i. p. 156 (1890).

Hab. Valley of the Ogové.

281. H. IRICOLOR, Holl. (Plate I. fig. 5.)

Proteides iricolor, Holl. Ent. News, vol. i. p. 156 (1890).

Hab. Valley of the Ogové.

PTEROTEINON, Wats.

(*Tanyptera*, Mab.)

282. P. LAUFELLA, Hew.

Hesperia laufella, Hew. Exot. Butt. vol. iv. *Hesp.* pl. ii. figs. 28–30 (1867).

Carystus laufella, Kirby, Syn. Cat. p. 591 (1871); Staudgr. Exot. Schmett. pl. 99 (1888).

Tanyptera laufella, Mab. Bull. Soc. Zool. France, p. 260 (1877).

Pteroteinon laufella, Wats. P. Z. S. 1893, p. 124.

Hab. Tropical West Africa.

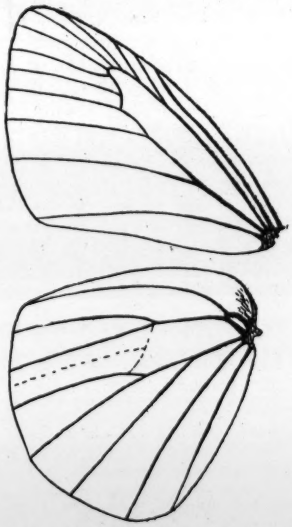
CHORISTONEURA, Mab.

283. C. APICALIS, Mab. (Plate V. fig. 1.)

Choristoneura apicalis, Mab. Bull. Soc. Ent. France, (6) vol. ix. p. clvi (1889).

Hab. Sierra Leone (*Mabille*).

This very remarkable insect is entirely unlike any other species which I have ever seen from the African continent, and recalls in general appearance some of the species of the S. American genus *Entheus*. At the time Lieut. Watson prepared his Revision of the



Neuration of *Choristoneura apicalis*, Mab. ½.

genera of the Hesperiidæ, no specimen of this insect was available by him for purposes of study. I take pleasure in incorporating a cut giving the neuration. From this it will be seen by the student

that the neuration is quite peculiar, and that Mons. Mabille, the author of the genus, was abundantly justified by the facts in erecting it for the reception of the typical species.

GAMIA, gen. nov.

Antennæ long, slender; club robust, tapering gradually, produced at the apical extremity to a fine point, which is slightly recurved. Palpi: first joint short; second joint long, both heavily clothed with hair; the third joint long, produced and conical, almost naked; the hind tibiæ with a double pair of spurs, and heavily clothed with long hair. Fore wing: inner margin longer than outer margin; the costa evenly rounded; the apex obtuse; the outer margin slightly excavated above the outer angle; cell more than two-thirds the length of costa; vein 12 reaches the costa before the end of the cell; vein 5 very slightly nearer vein 4 than vein 6; vein 7 from the end of the cell, very near vein 6; vein 3 very near vein 4, from near the lower angle of the cell;

Antennæ and palpi of *Gamia galua*, Holl. ¾.

vein 2 from one-third of the distance from the base to vein 3. Secondaries: costal and outer margins evenly rounded, produced at the anal angle and slightly truncated at anal angle; vein 5 present and distinct; vein 4 from the lower angle of the cell; vein 3 slightly before the lower angle; vein 2 twice as far from vein 3 as the latter is from vein 4; vein 7 from about the middle of the cell.—The insects belonging to this genus are large in size, dark in colour, with the primaries and secondaries ornamented with large translucent yellow spots. *G. buchholzi* is the largest of all the African Hesperiidæ, with the exception of *Rhopalocampta ithis*. They are distinctly separate from the genus *Cœnides*, to which they are apparently allied by the peculiar form of the palpi.

Type *G. galua*, Holl.

284. G. GALUA, Holl. (Plate L. fig. 1, ♀.)

Proteides galua, Holl. Ent. News, vol. ii. p. 3 (1891).

Hesperia zintgraffi, Karsch, Ent. Nachr. vol. xviii. p. 178 (1892).

? *Proteides ditissimus*, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. cxii (1891).

Hab. Tropical West Africa.

A comparison of my species with the type of *H. zintgraffi*, Karsch, shows the two to be identical. I am also strongly inclined to the opinion that *P. ditissimus*, Mab., is the same insect. Unfortunately I have not seen the type of *P. ditissimus*. Mons. Mabille affirmed the identity of the two species when examining my type, but has since expressed in letters a different opinion.

285. G.(?) DITISSIMUS, Mab.

Proteides ditissimus, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. cxii (1891).

Hab. Sierra Leone (*Mabille*).

Very probably the same as the foregoing species (*q. v.*).

286. G. BUCHHOLZI, Ploetz.

♀. *Hesperia buchholzi*, Ploetz, S. E. Z. vol. xl. p. 354 (1879), vol. xliii. p. 330 (1882).

Gangara (?) *basistriga*, Holl. Ent. News, vol. v. p. 29, pl. i. fig. 12 (1894).

Hab. Aburi (*Ploetz*); Ogové (*Holland*).

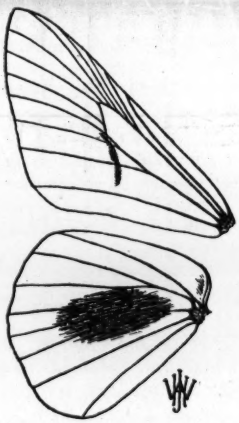
Strangely enough, none but females of this species have been found thus far. The type was a unique female in the collection made by Buchholz. There is another specimen in my collection, and another still in the hands of Mons. Mabille, to which he has affixed the MS. name "*robustus*."

CÆNIDES, gen. nov.

Antennæ long, slender; club moderate, long, produced at the apical extremity to a long fine point, bent back at a right angle. Palpi: first joint short, second joint long, erect, reaching the tip of the vertex, both densely clothed with long hair; third joint minute, erect, and almost concealed by the hairy vestiture of the second joint. Primaries with the inner margin longer than the outer margin, or, in some species, subequal. Cell slightly less than two-thirds the length of the costa; vein 12 of the primaries terminating before the end of the cell; vein 7 arising slightly before the end of the cell; vein 5 much nearer 4 than 6; vein 3 near vein 4; vein 2 from about the middle of the lower margin of the cell. The secondaries with vein 5 obsolete, or very faintly visible; discocellulars faint, angulated, with the point of the angle turned toward the base; cell short. Legs armed with double sets of spurs on the hind tibiæ.

The species of this genus, which is a large one, may be arranged in four groups. The first is represented typically by *C. dacela*, Hew., in which the primaries of the male have a sexual curved stigma below the cell crossing veins 3 and 2, and a large oval patch of raised, glossy hairs upon the outer end of the cell of the secondaries, covering the origin of veins 2, 3, and 4, and extending beyond toward the outer margin. The second group is represented by species in which the large oval patch of raised scales on the secondaries is absent, or at most represented by a tuft of loose and not conspicuous hairs. The discal band of the primaries is present. This group is composed of species of which *C. maracanda* and *C. leonora* are typical. The third group is composed of species in which the sexual brand of the primaries in the male is absent, while the large oval patch of hairs in the secondaries remains.

This division of the genus contains *C. benga* and possibly others. The fourth group is composed of species in which both secondaries and primaries are without sexual brands or marks of a conspicuous and easily discernible character, the brands and patches of raised scales being revealed in some of the forms only after bleaching and microscopic examination, and then as merely obsolescent.



Neuration of *Cœnides dacela*, Hew. ♀.

In the species of all these four groups the antennæ, the palpi, the neuration, and the outline of the wings are the same. They are differentiated into groups by the sexual markings of the male sex, so far as my studies have informed me. Most of the species have been hitherto referred by writers to the genus *Proteides*, to which they manifestly do not belong.

287. C. DACELA, Hew. (Plate II. fig. 2, ♂ ; Plate V. fig. 18, ♀.)

Hesperia dacela, Hew. Ann. & Mag. Nat. Hist. (4) vol. xviii. p. 451 (1876).

Hesperia nydia, Ploetz, S. E. Z. vol. xl. p. 353 (1879), vol. xliii. p. 326 (1882).

♀. *Plastingia podora*, Ploetz, S. E. Z. vol. xlv. p. 150 (1884).

As to the identification of the male of this species with the insect described by Ploetz as *Hesperia nydia*, there is not a shadow of doubt in my mind. The insect described by Ploetz as *Plastingia podora* was contained in the Berlin Museum. The insect labelled as such was examined for me both by Dr. Karsch and Dr. Scudder, and is represented in the plates accompanying this article, being reproduced after a careful drawing by Von Prillwitz. It is unmistakably the female of *C. dacela*. Unfortunately, however, the description given by Ploetz of his *P. podora* does not tally with the

insect which, bearing his own manuscript label, is accepted as the type. I have been puzzled to find a satisfactory solution of the difficulty, but have resolved to accept the authenticated type specimen as the key to the problem, and have therefore given the synonymy as above. Of course it is quite possible that a misplacement of the original label may have taken place, but at this distance, both of space and time, I am not in a position to clear up the difficulty. The description given by Ploetz is, as usual, not clear enough to help to a positive conclusion as to what he meant by it.

288. C. SORITIA, Hew. (Plate I. fig. 9.)

♂. *Hesperia soritia*, Hew. Ann. & Mag. Nat. Hist. (4) vol. xviii. p. 453 (1876).

♀. *Proteides xychus*, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. cxi (1891).

Proteides xantho, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. cxi (1891).

Hab. Gaboon, Sierra Leone.

Upon a comparison of the types of *P. xychus* and *P. xantho*, Mab., with the type of *H. soritia*, Hew., it becomes plain that they are one and the same species. The females vary in the amount of maculation on both the upper and under side of the secondaries. Some specimens have a distinct pale discal spot at the end of the cell upon the lower side of the secondaries, followed by a discal curved series of similar small spots, frequently obscurely visible upon the upper surface; other specimens are almost devoid of these markings, which are generally more or less obsolescent. A female with these markings more distinct than usual was selected by Mons. Mabille as the type of his *xantho*. It is before me as I write, and I cannot feel justified in regarding it as separate from *C. soritia*. In a long series of specimens of *soritia*, such females are not at all uncommon.

289. C. KANGVENSIS, sp. nov. (Plate I. fig. 10.)

♂. Body with palpi and antennæ, as well as legs, brown, the under surfaces slightly paler than the upper surfaces. The wings are brown, somewhat inclining to tawny fuscous at the base. The cilia are pale fuscous. The primaries are marked with three minute subapical spots, arranged in a curved series, by a large quadrate spot at the end of the cell, which is notched on its outer margin, and by two moderately large subquadrate spots, lying one on either side of vein 3 at its origin, the lower spot being the largest. There is a fine raphe, or sexual brand, running along the inner margin of this large spot and continued across interval 1 toward the inner margin. The secondaries have the end of the cell and a portion of the disc immediately beyond the end covered by a large oval patch of raised glossy black hairs. On the underside the primaries are paler on the apical third, with the inner margin broadly pale testaceous. The translucent spots of the

upper surface reappear on this side, though less distinctly defined, owing to the paler ground-colour. The secondaries are dark brown, slightly touched with greyish on the outer margin near the outer angle. There are a few obscure pale discal spots beyond the cell.

♀. The female is marked like the male, but lacks, of course, the characteristic sexual markings of the male. The wings are more elongated and rounded, and the primaries have a translucent yellow spot on interval 1, midway between the base and the outer margin.

Expanse, ♂ 40 mm., ♀ 43 mm.

Hab. Valley of the Ogové.

This species is closely related to *C. soritia*, Hew., but is quite distinct.

290. C. MARACANDA, Hew. (Plate I. fig. 4.)

Hesperia maracanda, Hew. Ann. & Mag. Nat. Hist. (4) vol. xviii. p. 450 (1876).

Casyapa masacanda, Kirby, Syn. Cat. Suppl. p. 817 (1877).

Hab. Angola (*Hewitson*); Gaboon (*Good*).

291. C. BINOEVATUS, Mab. (Plate II. fig. 1.)

Proteides binoevatus, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. cxii (1891).

Hab. Valley of the Ogové.

292. C. LEONORA, Ploetz. (Plate II. fig. 5.)

Hesperia leonora, Ploetz, S. E. Z. vol. xl. p. 355 (1879), vol. xliii. p. 338 (1882).

Proteides xanthargyra, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. cxii (1891).

Pamphila leonora, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 253 (1893).

Hab. Aburi (*Ploetz*); Accra (*Mabille*); Togoland (*Karsch*); Valley of Ogové (*Good*).

The number of the small subapical spots in this species is variable. Some specimens have but two, others three, while the type of Ploetz is destitute of such spots. The absence of the sexual brand on the upperside of the primaries of the male is apparently the only mark of distinction having generic weight which would lead me to separate this species from the foregoing three. If there are other points, I have failed to discover them, and I hesitate to erect a new genus for the reception of this species without some more evident reason.

293. C. STOEHRI, Karsch.

Pamphila stoehri, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 252, pl. vi. fig. 6 (1893).

Hab. Togoland (*Karsch*); Gaboon (*Mocquerys*).

The type was a damaged male. The collection of Dr. Staudinger

contains two perfect females of this fine species, taken at Gaboon by Mocquerys according to the labels. The female is like the male, but larger in size, and with the underside of the wings redder than in the figure of the type given by Karsch. It is singular that during the eight years in which I have had a collector constantly residing and at work for me in French Congo, this species has not turned up. It evidently must be very rare, or very local in its distribution.

294. C. BENGA, Holl. (Plate I. fig. 13.)

Proteides benga, Holl. Ent. News, vol. ii. p. 4 (1891).

Hab. Valley of the Ogové.

295. C. CYLINDA, Hew. (Plate I. fig. 12.)

Hesperia cylinda, Hew. Ann. & Mag. Nat. Hist. (4) vol. xviii. p. 449 (176).

Pamphila calpis, Karsch (*nec* Ploetz), Berl. Ent. Zeit. vol. xxxviii. p. 252, pl. vi. fig. 4 (1893).

(*Proteides ruralis*, Mab. MS., *cf.* Staudinger's price-lists.)

Hab. Tropical Western Africa. Very common at Gaboon.

This species has been labelled *P. ruralis* by Mons. Mabille in several collections, and has been sold under this name by Dr. Staudinger. I can find no account of the publication of the species by Mons. Mabille, and believe the name to be hitherto unpublished, except as stated, and as it is once or twice referred to in the writings of Mons. Mabille. It seems at all events to have totally escaped the notice of the compilers of the 'Zoological Record' and Bertkau's 'Register,' and, though I have twice asked Mons. Mabille to inform me where the species is described, he has failed to include an answer to this question with the other information he has so kindly and generously given me. The identification of this species with *P. calpis*, Ploetz, by Dr. Karsch is based upon specimens so labelled in the Berlin Museum; but these are not types, and came from Senegal, and were not labelled by Ploetz. There is, further, no agreement whatever between the insect figured by Karsch and the description of *P. calpis* given by Ploetz. A comparison of the figure given by Karsch shows the entire identity of the insect with Hewitson's *H. cylinda*. The true *calpis* is figured in this paper. It is the female of *Hidari cœnira*, Hew.

C. cylinda is a crepuscular insect, as I have been informed by the late Dr. Good. It only appears at dusk in the morning or the evening, though occasionally on dark and cloudy days it may be seen upon the wing. I have one or two examples which were taken at lamp-light, having flown into the room after dark.

296. C. DACENA, Hew.

Hesperia dacena, Hew. Ann. & Mag. Nat. Hist. (4) vol. xviii. p. 453 (1876).

Proteides leucopogon, Mab. C. R. Soc. Ent. Belg. vol. xxxv. p. cxi (1891); Nov. Lepidopt. p. 111, pl. xv. fig. 5 (1893).

Hab. Gaboon, Cameroons.

297. C. ORMA, Ploetz.

Ismene orma, Ploetz, S. E. Z. vol. xl. p. 363 (1879), vol. xlv. p. 59 (1884).

Hesperia violascens, Ploetz, S. E. Z. vol. xliii. p. 322 (1882).

Pamphila violascens, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 248, pl. vi. fig. 3 (1893).

Hab. Cameroons, Ogové Valley.

H. violascens was described, as Dr. Karsch has shown, from a drawing of the upperside of a specimen named *violascens* by Maassen. Had Ploetz seen the specimen from which the drawing was made, he would no doubt have recognized in it his own *I. orma*. The underside is unmistakable. Dr. Karsch has correctly determined the species as *violascens*, Ploetz, but has failed to recognize its identity with the species described as *orma* by Ploetz, and referred by him to the genus *Ismene*. This reference is sufficiently exact to suffice, though I have been inclined to create a subdivision of the genus for the reception of this species, owing to the fact that the antennæ are not so greatly swollen below the tip as in the other species of the genus, and the outer margin of the secondaries is not so strongly excavated before the anal angle. It is worthy of note that the white band on the underside of the secondaries varies greatly, and in some specimens is reduced to a narrow line, and in others is almost obsolete.

298. C. CORDUBA, Hew.

Hesperia corduba, Hew. Ann. & Mag. Nat. Hist. (4) vol. xviii. p. 454 (1876).

Protcides massiva, Mab. & Vuill. Nov. Lepidopt. p. 21, pl. iii. fig. 4 (1891).

Hab. Gaboon, Sierra Leone.

This species is very common in the Valley of the Ogové. Thus far, singularly enough, I have never seen a male specimen. Of the twenty-five, or more, examples in my collection, all appear to be females.

299. C. WAGA, Ploetz.

Telesto waga, Ploetz, S. E. Z. vol. xlvii. p. 108 (1886).

Hab. Aburi (*Ploetz*).

From a copy of the figure of this species contained in the unpublished collection of drawings made by Herr Ploetz, and to which he refers in his descriptions, this insect is closely allied to *C. cylinda*, Hew., and, if I am not greatly mistaken, the drawing represents a rubbed specimen of *C. cylinda*; certainly specimens of *cylinda* in poor condition agree extremely well with the figure of Ploetz.

300. C. ILERDA, Moeschler.

Hesperia ilerda, Moeschler, Abhandl. Senckenb. naturf. Ges. Bd. xv. p. 65, pl. i. fig. 16 (1887).

Pamphila ilerda, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 251 (1893).

Hab. Tropical West Africa.

I have specimens of what are undoubtedly *C. cylinda*, Hew., which agree absolutely with the figure of *ilerda* given by Moeschler. Unfortunately Moeschler does not give a representation of the underside of his specimen, and I am therefore left in doubt as to whether the two species are identical.

301. C. LACIDA, Hew. (Plate I. fig. 14.)

Hesperia lacida, Hew. Ann. & Mag. Nat. Hist. (4) vol. xviii. p. 453 (1876).

Hab. Gaboon (*Hewitson*).

The type of Hewitson is a female.

302. C. ZAREMBA, Ploetz. (Plate V. fig. 5.)

Telesto zaremba, Ploetz, S. E. Z. vol. xlv. p. 376 (1884).

Hab. Old Calabar (*Ploetz*); French Congo (*Mocquerys*).

There are two somewhat damaged specimens in the collection of Dr. Staudinger. The reference to this genus seems proper, though, in the rubbed condition of the upperside of the secondaries of both examples, I am unable to make sure of the presence of the tuft of long hairs upon the cell which is characteristic of most of the species of the genus.

303. C. BALENGE, Holl. (Plate I. fig. 3.)

Proteides balenge, Holl. Ent. News, vol. ii. p. 4 (1891).

Hab. Valley of the Ogové.

The type is a female, and remains so far unique in my collection. A fine male is contained in the collection of Dr. Staudinger. These are, so far as I know, the only examples extant in the museums of the world of this fine species, which is one of the largest of the African Hesperiidæ. The female and the male do not differ materially, except in size and the form of the wings, as is usual.

304. C. SEXTILIS, Ploetz.

Hesperia sextilis, Ploetz, S. E. Z. vol. xlvii. p. 89 (1886); Moeschler, Abhandl. Senck. naturf. Ges. Bd. xv. p. 64 (1887).

Hab. Aburi (*Ploetz*).

This species is stated by Moeschler to belong to the same group as *C. calpis*, Ploetz, by which sign it might be located in the genus *Hidari*, were it not for the fact that in some way or other some German authors have come to traditionally regard the insect named *cylinda* by Hewitson as being the one designated as *calpis* by Ploetz. Moeschler is one of the authors who held this view,

and hence I place *sextilis* in the same group as *cylinda*. I do not know the species under this name at all events.

305. C. (?) PROXIMA, Ploetz.

Hesperia proxima, Ploetz, S. E. Z. vol. xlvii. p. 95 (1886).

Hab. West Africa (*Ploetz*).

I only know this species from a copy of the drawing by Ploetz. In the form of the wings it suggests affinity to the species which I have located in the genus *Cœnides*, but it probably does not belong there.

ARTITROPA, gen. nov.

Antennæ moderately long, more than half the length of the costa of the primaries; club robust, elongated, terminating in a short fine point slightly recurved. Palpi stout, erect, reaching the top of the vertex; the second and third joints are densely clothed with hair; the third joint is minute, almost concealed in the vestiture of the second joint. The legs have the tibiæ scantily

Neuration of *Artitropa erinnys*, Trim., ♂. ½.

clothed with long hair; those of the posterior pair are armed with a median and double terminal spurs. The primaries have the costa slightly rounded; the inner and the outer margins are subequal, evenly rounded; the cell is two-thirds the length of the costa, with the upper angle acute, the lower angle obtuse; vein 5 slightly nearer vein 4 than vein 6; vein 12 terminates on the costa before the end of the cell; vein 7 arises slightly before the end of the cell; vein 2 is more than twice as far from vein 3 as vein 3 is from vein 4 and is equidistant between vein 3 and the base. The cell of the secondaries is short; vein 5 is present and distinct; vein 3 and vein 7 arise well before the end of the cell; the outer margin is rounded and slightly excavated above the termination of vein 1*b*.

Type *A. erinnys*, Trimen.

I have erected this genus for the reception of the following species, which are distinguished from all other near allies in the genus *Cœnides* and allied genera by the shape of the club of the antennæ, by their more robust form, and by their peculiar style of coloration. They form a well-marked group.

306. A. ERINNYS, Trim.

Pamphila erinnys, Trim. Trans. Ent. Soc. Lond. (3) vol. i. p. 290 (1861); Rhop. Afr. Austr. vol. ii. p. 303, pl. vi. fig. 8 (1866); S. Afr. Butt. vol. iii. p. 326 (1889).

Hab. Southern Africa.

307. A. COMUS, Cram.

Papilio comus, Cram. Pap. Exot. iv. pl. 391. figs. N, O (1782).
Papilio helops, Dru. Ill. Ex. Ent. iii. pl. xxxiii. figs. 2, 3 (1782).
Hesperia ennius, Fabr. Ent. Syst. iii. 1, p. 337 (1793); Latr. Enc. Méth. vol. ix. p. 749 (1823).
Papilio ennius, Don. Ins. India, p. 59, pl. li. fig. 1 (1800).
Proteides helops, Butl. Cat. Fabr. Diurn. Lep. p. 265 (1869); Kirby, Syn. Cat. p. 595 (1871).
Pamphila comus, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 249 (1893).

Hab. West Africa. (Err. "*Surinam*," Cram.; "*In Indiis*," Drury.)

308. A. MARGARITATA, Holl. (Plate I. fig. 2.)

Proteides margaritata, Holl. Ent. News, vol. i. p. 155 (1890).

Hab. Valley of the Ogové.

I have been inclined to regard this species as identical with *A. comus*, Cram. But an examination of specimens made for me by my good friend Dr. S. H. Scudder, at Berlin and at the British Museum, he having in his possession at the time the drawing which is reproduced in the Plate, casts a great doubt upon the correctness of this view. Dr. Scudder says, "Your *margaritata* is most certainly not the insect labelled *helops*=*comus* in the British Museum, and is very doubtfully the insect known as *comus*, in the Museum in Berlin." I had sunk my name as a synonym until receiving this opinion from my learned friend, who is recognized as a very high authority in all such matters.

309. A. BOSEÆ, Saalm.

Hesperia boseæ, Saalm, Lep. von Madgr. p. 105, pl. i. figs. 15, 16 (1884).
Proteices boseæ, Mab. Grand. Madgr. vol. xviii. p. 329, pl. lii. figs. 10, 10 *a* (1887).

Hab. Madagascar.

309 *a*. A. SHELLEYI, Sharpe [1].

Proteides shelleyi, E. M. Sharpe, Ann. & Mag. N. H. (6) vol. vi. p. 349 (1890).

Hab. Fantee (*Capt. Shelley*).

[1] Unfortunately this species was by an oversight omitted when the MS. was in preparation.

PLOETZIA, Saalm.

(*Systole*, Mab.)

310. P. AMYGDALIS, Mab.

Hesperia amygdalis, Mab. Bull. Soc. Zool. France, 1877, p. 234.
Systole amygdalis, Mab., Grandidier's Madagascar, vol. xviii. p. 330, pl. li. figs. 6, 6 *a*, 7 (1887).
Ploetzia amygdalis, Saalm. Lep. Madgr. vol. i. p. 115 (1884).
Hab. Madagascar.

311. P. FIARA, Butl.

Proteides fiara, Butl. Trans. Ent. Soc. Lond. 1870, p. 503; Staudgr. Exot. Schmett. vol. ii. pl. 99 (1888).
Pamphila fiara, Trim. S. Afr. Butt. vol. iii. p. 329 (1889).
Hab. South Africa.

312. P. DYSMEPHILA, Trim.

Pamphila dysmephila, Trim. Trans. Ent. Soc. Lond. 1868, p. 96, pl. vi. fig. 10.
Hesperia mucorea, Karsch, Ent. Nachr. vol. xviii. p. 178 (1892).
Hab. South Africa, Togoland.
Through the kindness of Dr. Karsch I have been permitted to have a carefully drawn figure of his *Hesperia mucorea* executed by Herr Prillwitz, and it proves upon comparison with typical specimens of the male of *P. dysmephila*, received from Mr. Trimen, to be the same. The absence of the white line upon the underside of the secondaries, which is so conspicuous in the female, and is brought out characteristically in the figure given by Mr. Trimen, is calculated to mislead the student who is not aware of this difference in the marking of the sexes.

313. P. CERYMICA, Hew.

Hesperia cerymica, Hew. Ex. Butt. iv. *Hesp.* pl. ii. figs. 20, 21 (1867).
Carystus cerymica, Kirby, Syn. Cat. p. 591 (1871); Trim. S. Afr. Butt. vol. iii. p. 329, footnote (1889).
Hab. Tropical West Africa.
Mr. Trimen is quite right in his surmise expressed on p. 329 of the third vol. of his 'S. African Butterflies.'

314. P. QUATERNATA, Mab.

Pamphila quaternata, Mab. Bull. & Ann. Soc. Ent. France, (5) vol. vi. pp. xxvi & 268 (1876).
Hab. Senegal (*Mabille*).
This species is stated by the author to be very closely allied to *P. dysmephila*, Trim. The type was unique.

315. P. CAPRONNIERI, Ploetz.

Hesperia capronnieri, Ploetz, S. E. Z. vol. xl. p. 353 (1879), vol. xliii. p. 326 (1882).

Proteides capronnieri, Mab. Ann. Soc. Ent. France, (6) vol. x. p. 33, pl. iii. fig. 3 (1890).

Hab. Aburi (*Ploetz*), Cameroons (*Mabille*).

This is a very distinct species. The female lacks the broad white anterior margin on the upperside of the costal area of the secondaries which is so conspicuous a feature in the male.

316. P. WEIGLEI, Ploetz.

Hesperia weiglei, Ploetz, S. E. Z. vol. xlvii. p. 90 (1886); Moeschler, Abhandl. Senck. naturf. Ges., Bd. xv. p. 65, pl. i. fig. 18 (1887).

Pamphila weiglei, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 253 (1893).

Hab. Tropical West Africa.

I am strongly inclined to think that this species is only a form of *P. cerymica*, Hew.

317. P. NOBILIOR, sp. nov. (Plate V. fig. 2.)

♀. The antennæ are marked with white on the lower side of the club. The body above and below and the wings upon the upperside are tawny fuscous. The primaries are marked by four waxen yellow translucent spots in the cell near its end, and by two similar discal spots, one on either side of vein 3 near its origin. Of the two spots in the cell the upper one is very small and the lower is much larger, oval, produced. The two discal spots are subquadrate, and the lower one is thrice the size of the upper one. The cilia are paler than the body of the wing, and the costa is also paler toward the base. On the underside both wings are rich dark maroon, growing paler towards the outer margin. The nervules are more or less white and stand out distinctly upon the darker ground, especially at their extremities on the primaries, and in the case of veins 6, 7, and 8 on the secondaries. The triangular space on the secondaries between veins 6 and 7 is perceptibly paler than the rest of the wing. The translucent spots appear upon the lower surface of the primaries as upon the upperside, and in addition the inner margin of the primaries is pale testaceous. The secondaries have a minute white spot in the cell near its end, and two similar white spots, one on either side of vein 2 about midway between its origin and the outer margin.

Expanse 48 mm.

Hab. Lambarene, French Congo (*Mocquerys*).

The type is in the collection of Dr. Staudinger.

ACALLOPISTES, gen. nov.

Antennæ slender, more than half as long as the costa of the primaries; club about one fourth the length of the entire antennæ, suddenly enlarging and then gradually tapering to the tip, gently

recurved. The palpi are short, with the first and second joints densely clothed with hairs, the third joint minute and almost concealed by the vestiture of the second joint. The tibiæ are clothed with long hairs, and those of the hind legs are armed with

Head and neuration of *Acallopistes holocausta*, Mab., ♂. ♀.

double terminal spurs. The anterior wings are subtriangular, with the inner and outer margins subequal and straight. The costa is evenly rounded, the apex is acute. The cell of the primaries is a little less than two-thirds the length of the costa, with the upper angle acute and the lower angle obtuse. Vein 12 reaches the costa before the end of the cell; vein 5 is slightly nearer vein 4 than vein 6; veins 6, 7, and 8 rise from about the upper angle of the cell; vein 3 is twice as far from vein 2 as from vein 4; vein 2 is equidistant between the base and vein 3. The secondaries have the costa relatively straight. The outer margin is evenly rounded to the extremity of vein 1 *b*, at which the wing is produced somewhat sharply. The inner margin is gently rounded and somewhat excavated before the base. The cell is less than half the distance from the base to the outer margin. Vein 5 is distinct. Vein 2 arises beyond the middle of the lower margin of the cell, vein 3 a little before its end. Vein 7 arises from well before the end of the cell, and vein 3 twice as far from vein 7 as from the base.

Type *A. holocausta*, Mab.

The two species referable to this genus are moderately large insects, uniformly dark in colour and without any conspicuous markings.

318. A. HOLOCAUSTA, Mab. (Plate V. fig. 13.)

Erinota holocausta, Mab. C. R. Soc. Ent. Belg. 1891, p. cxi.

Hab. Cameroons (*Mabille*).

This insect is not an *Erinota*, nor in any way nearly related to the insects properly included in that genus. I find it more closely

allied to the insects belonging to that section of the genus *Rhopalocampta* which contains *R. unicolor*, Mab., and *R. libeon*, Druce, but thoroughly separate from them by reason of the different structure of the palpi and the antennæ.

319. A. DIMIDIA, sp. nov. (Plate V. fig. 7.)

♂. Antennæ, body, and wings both above and below uniformly dark brown, with a slight greenish sheen on the disc of the primaries when viewed in strong sunlight. The palpi on the lower side are orange-coloured. Expanse 40 mm.

Hab. Gaboon (*Mocquerys*).

The type of this insect is contained in the collection of Dr. Staudinger and is unique. On comparison with *A. holocausta*, Mabille, the chief points of difference are the smaller size and the more obscure colouring, for *A. holocausta* has the primaries and secondaries somewhat plentifully sprinkled with golden-orange scales near the base, and the general coloration is brighter. There is no doubt in my mind as to the specific distinctness of this form upon comparison. The facies is quite distinct, though the species are very closely related.

RHOPALOCAMPTA, Wallgr.

320. R. RAMANETEK, Boisd.

Thymele ramanetek, Boisd. Faune Entom. Madgr. p. 62, pl. ix. fig. 3 (1833).

Ismene ramanetek, Kirby, Syn. Cat. p. 581 (1871); Mab., Grandid. Madgr. vol. xviii. p. 326, pl. ħ. figs. 2, 2 *a* (1887).

Rhopalocampta ramanetek, Watson, P. Z. S. 1893, p. 129.

Hab. Madagascar.

321. R. UNICOLOR, Mab.

Ismene unicolor, Mab. Ann. Soc. Ent. France, (5) vol. vii. p. xxxix (1877); Bull. Soc. Zool. France, 1877, p. 230.

Hesperia unicolor, Trim. S. Afr. Butt. vol. iii. p. 375.

Hab. South Africa, Western Africa as far north as Liberia. Very common on the Ogové River.

322. R. LIBEON, Druce.

Ismene libeon, Druce, P. Z. S. 1875, p. 416.

Hesperia libeon, Trim. S. Afr. Butt. vol. iii. p. 375.

Rhopalocampta libeon, Watson, P. Z. S. 1893, p. 129.

Hab. Angola (*Druce*).

Closely allied to *R. unicolor*, Mab.

323. R. BRUSSAUXI, Mab.

Ismene brussauxi, Mab. Bull. Soc. Ent. France, 1890, p. ccxxi.

Hab. French Congo (*Mabille*).

This species was described by Mons. Mabille from a defective example. It is evidently very near *R. libeon* and *R. unicolor*.

324. R. ANDONGINIS, Ploetz.

Ismene andonginis, Ploetz, S. E. Z. vol. xlv. p. 60 (1884).

Hab. Angola (Pundo Ndongo) (*Ploetz*).

I do not know this species in nature, but from the description judge it to be very near *R. unicolor* and *R. libeon*.

325. R. ÆSCHYLUS, Ploetz.

Ismene æschylus, Ploetz, S. E. Z. vol. xlv. p. 65 (1884).

Hab. Senegal (*Ploetz*).

The description applies quite well to *R. chalybe*, Westw., in everything except the colour of the fringes of the secondaries, which are said to be white shading into orange at the anal angle, and the head, which is said to be red. I do not know the species in nature.

326. R. PANSA, Hewits.

Ismene pansa, Hewits. Exot. Butt. vol. iv. *Ismene*, pl. i. figs. 1, 2 (Jan. 1867).

Hesperia ernesti, Grand. Rev. et Mag. de Zool. p. 274 (1867).

Ismene pansa, Kirby, Syn. Cat. p. 581 (1871); Saalm. Lep. Madgr. p. 114, pl. i. figs. 12, 13 (1884); Mab., Grandid. Madgr. vol. xviii. p. 325, pl. li. figs. 3, 3 *a* (1887).

Rhopalocampta pansa, Watson, P. Z. S. 1893, p. 129.

Hab. Madagascar.

327. R. ANCHISES, Gerst.

Ismene anchises, Gerst. Gliederth.-Fauna d. Sansibar-Gebiet. p. 374, pl. xv. figs. 6, 6 *a* (1873).

Ismene taranis, Hewits. Ann. & Mag. N. Hist. 4th ser. vol. xviii. p. 347 (1876).

Hesperia anchises, Trim. S. Afr. Butt. vol. iii. p. 374 (1889); (larva described) Matthew, Ent. Mo. Mag. xxv. p. 428.

Rhopalocampta anchises, Watson, P. Z. S. 1893, p. 129.

Hab. South Africa and Eastern Tropical Africa.

328. R. JUCUNDA, Butl.

Hesperia jucunda, Butl. P. Z. S. 1881, p. 179, pl. xviii. fig. 8.

Rhopalocampta jucunda, Watson, P. Z. S. 1893, p. 129.

Hab. Socotra (*Balfour*).

This is allied to *R. anchises*, Gerst.

329. R. FORESTAN, Cram.

Papilio forestan, Cram. Pap. Exot. iv. pl. cccxci. figs. E, F (1782).

Ismene florestan, Trim. (part), Rhop. Afr. Austr. vol. ii. p. 318 (1866).

Hesperia florestan, Trim. S. Afr. Butt. vol. iii. p. 368, vol. i.

pl. ii. figs. 6, 6 *a* (larva and chrysalis) (1889); (larva described) Matthew, Ent. Mo. Mag. xxv. p. 429.

Rhopalocampta forestan, Watson, P. Z. S. 1893.

The species is widely distributed in all the warm portions of the continent south of the Sahara.

330. R. ARBOGASTES, Guen.

Ismene arbogastes, Guen., Maill. Réunion, Ann. G, p. 19 (1833).

Thymele florestan, Boisd. Faune Entom. Madgr. p. 61 (1833).

Ismene margarita, Butl. Cist. Entom. vol. ii. p. 389 (1879).

Ismene arbogastes, Mab., Grand. Madgr. vol. xviii. p. 323, pl. li. figs. 5, 5 *a* (1887).

Rhopalocampta arbogastes, Watson, P. Z. S. 1893, p. 129.

Ismene arbagastes, Kirby, Syn. Cat., Suppl. p. 819 (1877).

Hab. Madagascar, Reunion.

Mr. Kirby in his Supplement to his Synonymic Catalogue cites Senegal as the habitat of this species. This is an error. The form is very closely allied to *R. forestan*, and Mons. Mabille regards it as probably merely an insular form of that species.

331. R. PISISTRATUS, Fabr.

Hesperia pisistratus, Fabr. Ent. Syst. iii. 1, p. 345, no. 311 (1793); Trim. S. Afr. Butt. vol. iii. p. 371, pl. xii. fig. 10 (1889).

Rhopalocampta valmaran, Wallgr. K. Sv. Vet.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 48.

Ismene florestan?, Trim. Rhop. Afr. Austr. vol. ii. p. 319 (1866).

Ismene pisistratus, Westw. (*part.*), Oates' Matabele Land, App. p. 352 (1881).

Ismene pisistratus, Staudgr. Exot. Schmett. vol. i. pl. 98 (1888).

Rhopalocampta pisistratus, Watson, P. Z. S. 1893, p. 129.

Hab. South and West Africa.

This species is very closely allied to *R. forestan*, from which it may be distinguished by the different shape of the white band on the underside of the secondaries, and the three black spots at the inferior termination of this band.

332. R. FERVIDA, Butl.

Hesperia fervida, Butl. Ann. & Mag. Nat. Hist. (5) vol. v. p. 339 (1880).

Ismene fervida, Mab., Grand. Madgr. vol. xviii. p. 324, pl. li. figs. 4, 4 *a* (1887).

Rhopalocampta fervida, Watson, P. Z. S. 1893, p. 129.

Hab. Madagascar.

333. R. KEITHLOA, Wallgr.

Rhopalocampta keithloa, Wallgr. K. Sv. Vet.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 48.

Ismene stella, Trim. Trans. Ent. Soc. Lond. 3rd ser. vol. i. p. 287 (1862).

Ismene keithloa, Trim. Rhop. Afr. Austr. vol. ii. p. 317 (1866).
Hesperia keithloa, Trim. S. Afr. Butt. vol. iii. p. 372, pl. xii. fig. 9 (1889).
Rhopalocampta keithloa, Watson, P. Z. S. 1893, p. 129.
Hab. South Africa.

334. R. BOCAGII, Sharpe.

Rhopalocampta bocagii, E. M. Sharpe, P. Z. S. 1893, p. 557.
Hab. Island of St. Thomas, W. Africa.
This species is allied to *R. keithloa*, Wallgr., upon the underside, but is distinguished by the bright metallic blue of the upperside.

335. R. RATEK, Boisd.

Thymele ratek, Boisd. Faune Entom. Madgr. p. 61, pl. ix. fig. 1 (1833).
Ismene ratek, Trim. Rhop. Afr. Austr. vol. i. p. 317 (1862); Kirby, Syn. Cat. p. 581 (1871); Mabille, Grandid. Madgr. vol. xviii. p. 326, pl. li. figs. 2, 2 *a* (1887).
Hesperia ratek, Trim. S. Afr. Butt. vol. iii. p. 373 (1889).
Rhopalocampta ratek, Watson, P. Z. S. 1893, p. 129.
Hab. Madagascar.
Mr. Trimen calls attention in the last volume of his work on South-African Butterflies to the fact that this species was erroneously cited in his former treatise as a South-African form. It is apparently confined to Madagascar.

336. R. HANNO, Ploetz.

I. hanno, Ploetz, S. E. Z. vol. xl. p. 363 (1879), vol. xlv. p. 63 (1884); Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 266 (1893).
Hab. Guinea, Valley of Ogové River.
The insect identified as *R. hanno* by Mons. Mabille, and figured in the 'Novitates Lepidopterologicæ,' is *R. necho*, Ploetz, as has been pointed out by Dr. Karsch. *R. hanno* is much nearer to, if not identical with, *R. sejuncta*, Mab.

337. R. NECHO, Ploetz.

Ismene necho, Ploetz, S. E. Z. vol. xlv. p. 63 (1884).
Ismene hanno, Mab., Vuill. Novit. Lep. fasc. iii. p. 18, pl. iii. fig. 1 (1891).
Ismene necho, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 266 (1893).
Hab. Cameroons, Valley of Ogové.
Mon. Mabille has given us an excellent figure of this species, which he has in error referred to *R. hanno*, Ploetz. The difference is very marked on the underside of the primaries of the two species, which in *R. necho* are light on the inner margin and beyond the end of the cell, and in *R. hanno* are dark, as in *R. sejuncta*, which I am inclined to regard as identical with *R. hanno*.

338. R. SEJUNCTA, Mab.

Ismene sejuncta, Mab., Vuill. Novit. Lepid. fasc. iii. p. 19, pl. iii. fig. 2 (1891).

Hab. Usagara (*Mab.*).

Except for the slightly more extended yellowish area on the upperside of the secondaries at the base, this species as figured by Mabille is almost the counterpart of specimens clearly referable to *hanno*, Ploetz.

339. R. TANCRED, Ploetz.

Ismene tancred, Ploetz, S. E. Z. vol. xlv. p. 62 (1884).

Hab. Natal.

This species, judging from the description, may be referred to either of the foregoing forms. It fits *hanno*, *necho*, and *sejuncta* equally well.

340. R. BIXÆ, Linn.

Papilio bixæ, Linn. Syst. Nat. ed. x. p. 485 (1758); Mus. Ulr. p. 335 (1764); Clerck, Icones, pl. 42. fig. 4 (1764); Linn. Syst. Nat. ed. xii. p. 795 (1767).

Ismene bixæ, Kirby, Syn. Cat. p. 582 (part.) (1871); Auriv. Kongl. Sv. Vet.-Akad. Handl. Bd. xix. no. 5, p. 122 (1882).

Rhopalocampta bixæ, Wats. P. Z. S. 1893, p. 129.

Hab. Tropical Western Africa.

341. R. CHALYBE, Westw.

Ismene chalybe, Westw., Doubl. & Hew. Gen. Diurn. Lep. pl. 79. fig. 2 (1852).

Papilio bixæ, Don. Nat. Rep. pl. clxv. (1826).

Ismene bixæ, Kirby, Syn. Cat. p. 582 (part.) (1871).

Rhopalocampta chalybe, Wats. P. Z. S. 1893, p. 129.

Hesperia (*Ismene*) *chalybe*, Karsch, Berl. Ent. Zeit. vol. xxxviii. p. 265 (1893).

Hab. Tropical Western Africa from the Ogové River to Togoland.

342. R. JUNO, Ploetz.

Ismene juno, Ploetz, S. E. Z. vol. xl. p. 364 (1879), vol. xlv. p. 66 (1884).

Hab. Cameroons.

This species appears at first sight to be a diminutive form of *R. iphis*.

343. R. IPHIS, Dru.

Papilio iphis, Dru. Ill. Exot. Ent. vol. ii. pl. xv. figs. 3, 4 (1773).

Papilio phidias, Cram. Pap. Exot. pl. 244. figs. A, B (1782).

Papilio jupiter, Fabr. Mant. Ins. ii. p. 87 (1787).

Hesperia jupiter, Latr. Enc. Méth. ix. p. 733 (1823).

Ismene iphis, Kirby, Syn. Cat. p. 582 (1871); (larva described) Kolbe, Ent. Nachr. vol. xiii. p. 17 (1887).

Rhopalocampta iphis, Watson, P. Z. S. Lond. 1893, p. 129.

Hab. Tropical West Africa.

SPECIES INCERTÆ SEDIS.

344. PAMPHILA AURES, Mab. C. R. Soc. Ent. Belg. vol. xxvii. p. lxiv.

Hab. East Africa.

I have been unable to ascertain anything in reference to this species beyond what is stated in the description, and cannot from that approximate its true location. I do not recognize it from the account given by the author among the species before me in nature.

345. PAMPHILA GONESSA, Hew. Ann. & Mag. Nat. Hist. (4) vol. xix. p. 76.

Hab. Angola.

The type of this insect cannot be found in the Hewitson collection, nor does it appear in Kirby's List of that collection. I have been unable to recognize it in nature from the brief diagnosis given by the author. It does not appear to be known to any of my correspondents.

346. HESPERIA SCHULZI, Ploetz, S. E. Z. vol. xliii. p. 326.

Hab. Angola.

The location of this species between *cerymica*, Hew., and *capronnieri*, Ploetz, by its author would seem to imply that it is closely related to these, and if so it would probably fall in the genus *Ploetzia*. In the absence, however, of any more definite clue, I leave it among the species the location of which is uncertain.

SPECIES POSSIBLY ERRONEOUSLY REFERRED TO THE AFRICAN FAUNA.

347. HESPERIA NASO, Fabr.

? East Indian (*vide* Butler, Catalogue of Fabrician Diurnal Lepidoptera, p. 271).

348. HESPERIA MANGO, Guen.

Hesperia manga, Guen. Vinson's Voyage Madgr. Lep., p. 40 (S.-American).

349. HESPERIA PRODICUS, Stoll, Supplément à Cramer's Papillons Exotiques, pl. xxxiii. fig. 6 (1791).

The figure suggests *H. cretacea*, Snell., ♀, more nearly than any other African species, but if it was intended for this it is certainly very crude. The habitat is given by Stoll as the Cape of Good Hope. Mr. Trimen ignores the species in his various works upon

the Butterflies of that region, and no doubt very properly. I have no certain clue to its identity, but think it very probable that it is South-American.

EXPLANATION OF THE PLATES.

Plate I.

Fig. 1. *Gamia galua*, Holl., ♂, p. 84.
2. *Artitropa margaritata*, Holl., ♂, p. 93.
3. *Cænides balenge*, Holl., ♀, p. 91.
4. „ *maracanda*, Hew., ♂, p. 88.
5. *Hidari iricolor*, Holl., ♂, p. 82.
6. *Cyclopides anomæus*, Ploetz, p. 50.
7. *Platylesches galesa*, Hew., ♂, p. 72.
8. *Baoris nyassæ*, Hew., ♀, p. 70.
9. *Cænides soritia*, Hew., ♂, p. 87.
10. „ *kangvensis*, Holl., ♂, p. 87.
11. *Hesperia colotes*, Druce, ♂, p. 25.
12. *Cænides cylinda*, Hew., ♂, p. 89.
13. „ *benga*, Holl, ♂, p. 89.
14. „ *lacida*, Hew., ♀, p. 91.
15. *Hidari laterculus*, Holl., ♂, p. 82.

Plate II.

Fig. 1. *Cænides binoevatus*, Mab., ♂, p. 88.
2. „ *dacela*, Hew., ♂, p. 86.
3. *Hidari cænira*, Hew., ♀, p. 82.
4. *Parnara* (?) *ursula*, Holl., ♂, p. 64.
5. *Cnæides leonora*, Ploetz, ♂, p. 88.
6. *Gorgyra johnstoni*, Butl., ♂, p. 32.
7. *Acleros ploetzi*, Mab., ♂, p. 29.
8. *Sarangesa astrigera*, Butl., p. 6.
9. *Gastrochæta meza*, Hew., ♂, p. 38.
10. *Sarangesa lugens*, Rogenhfr., ♂, p. 5.
11. *Gorgyra subfacatus*, Mab., ♂, p. 33.
12. *Platylesches nigerrima*, Butl., ♂, p. 73.
13. *Baoris xylos*, Mab., ♂, p. 67.
14. *Semalea pulvina*, Ploetz, ♂, p. 65.
15. *Platylesches nigricans*, Holl., ♂, p. 73.
16. *Kedestes fenestratus*, Butl., p. 56.
17. *Hypoleucis* (?) *enantia*, Karsch, p. 47.
18. *Katreus johnstonii*, Butl., p. 74.
19. *Acleros placidus*, Ploetz, ♂, p. 29.
20. *Baoris arela*, Mab., ♂, p. 68.
21. „ *alberti*, Holl., ♂, p. 67.
22. *Sarangesa lucidella*, Mab., ♂, p. 7.
23. *Andronymus neander*, Ploetz, ♂, p. 82.

Plate III.

Fig. 1. *Celænorhinus boadicea*, Hew., ♂, p. 14.
2. „ *medetrina*, Hew., p. 12.
3. „ *biseriata*, Hew., ♂, p. 13.
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5. „ *chrysoglossa*, Mab., ♂, p. 14.
6. *Padraona zeno*, Trim., ♂, p. 59.
7. *Pardaleodes xanthias*, Mab., ♂, p. 78.
8. *Rhabdomantis galatia*, Hew., ♀, p. 45.
9. *Pardaleodes xanthopeplus*, Holl., ♂, p. 76.
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Fig. 11. *Oxypalpus annulifer*, Holl., ♂, p. 39.
12. „ *ignita*, Mab., ♂, p. 39.
13. „ *ruso*, Mab., p. 39.
14. *Ceratrichia flava*, Hew., ♂, p. 79.
15. *Rhabdomantis galatia*, Hew., ♂, p. 45.
16. *Pardaleodes xanthopeplus*, Holl., ♀, p. 76.
17. *Prosopalpus duplex*, Mab., p. 54.
18. *Pardaleodes reichenowi*, Ploetz, ♀, p. 76.
19. *Parnara micans*, Holl., ♂, p. 63.
20. *Osmodes staudingeri*, Holl., ♀, p. 42.
21. *Pardaleodes bule*, Holl., ♂ ♀, p. 76.

Plate IV.

Fig. 1. *Osmodes loronia*, Hew., ♂, p. 40.
2. „ „ „ ♀, p. 40.
3. „ *thora*, Ploetz, ♂, p. 40.
4. „ *thops*, Holl., ♂, p. 43.
5. „ *thora*, Ploetz, ♀, p. 40.
6. „ *thops*, Holl., ♀, p. 43.
7. „ *chrysauge*, Mab., ♂, p. 41.
8. *Sarangesa aurimargo*, Holl., ♂, p. 8.
9. *Osmodes bang-haasii*, Holl., ♂, p. 42.
10. „ *adosus*, Mab., ♂, p. 41.
11. *Parnara subochracea*, Holl., ♂, p. 63.
12. *Pardaleodes parcus*, Karsch, ♂, p. 77.
= *astrape*, Holl.
13. *Osmodes adon*, Mab., ♂, p. 41.
14. *Pardaleodes xanthioides*, Holl., ♂, p. 78.
15. *Osmodes adon*, Mab., ♀, p. 41.
16. „ *distincta*, Holl., ♂, p. 43.
17. *Gorgyra rubescens*, Holl., ♂, p. 35.
18. „ „ „ ♀, p. 35.
19. *Pardaleodes sierræ*, Holl., ♂, p. 78.
20. *Semalea nox*, Mab., ♂, p. 66.
21. *Trichosemeia* (?) *hereus*, Druce, p. 16.
22. *Kedestes* (?) *lentiginosa*, Holl., ♀, p. 56.
23. *Osmodes lux*, Holl., ♂, p. 42.
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2. *Ploetzia nobilior*, Holl., ♀, p. 95.
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4. *Eagris fuscosa*, Holl., ♀, p. 18.
5. *Cænides zaremba*, Ploetz, ♂, p. 91.
6. *Baoris statirides*, Holl., ♂, p. 69.
7. *Acallopistes dimidia*, Holl., ♂, p. 97.
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10. *Gorgyra mocquerysii*, Holl., ♂, p. 33.
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13. *Acallopistes holocausta*, Mab., ♂, p. 96.
14. *Sarangesa thecla*, Ploetz, ♂, p. 8.
15. *Trichosemeia subolivescens*, Holl., ♂, p. 15.
16. *Gorgyra subflavidus*, Holl., ♂, p. 34.
17. *Baoris ilias*, Ploetz, ♂, p. 67.
18. *Cænides podora*, Ploetz, ♀, p. 86.
= *Cænides dacela*, Hew., ♀.

APPENDIX.

List of the Specific Names which have been applied to the Hesperiidæ *of Africa, which are cited in the foregoing paper.*

The numbers following the names refer to the serial numbers prefixed to the species. Names sunk as synonyms are printed in italics. Where a name has been used correctly and also incorrectly applied to another species as a synonym it is placed twice in the list in order to facilitate reference.

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2. On a Collection of Butterflies obtained by Mr. Richard Crawshay in Nyasa-land, between the Months of January and April 1895. By Arthur G. Butler, Ph.D., F.L.S., &c.

(Plate VI.)

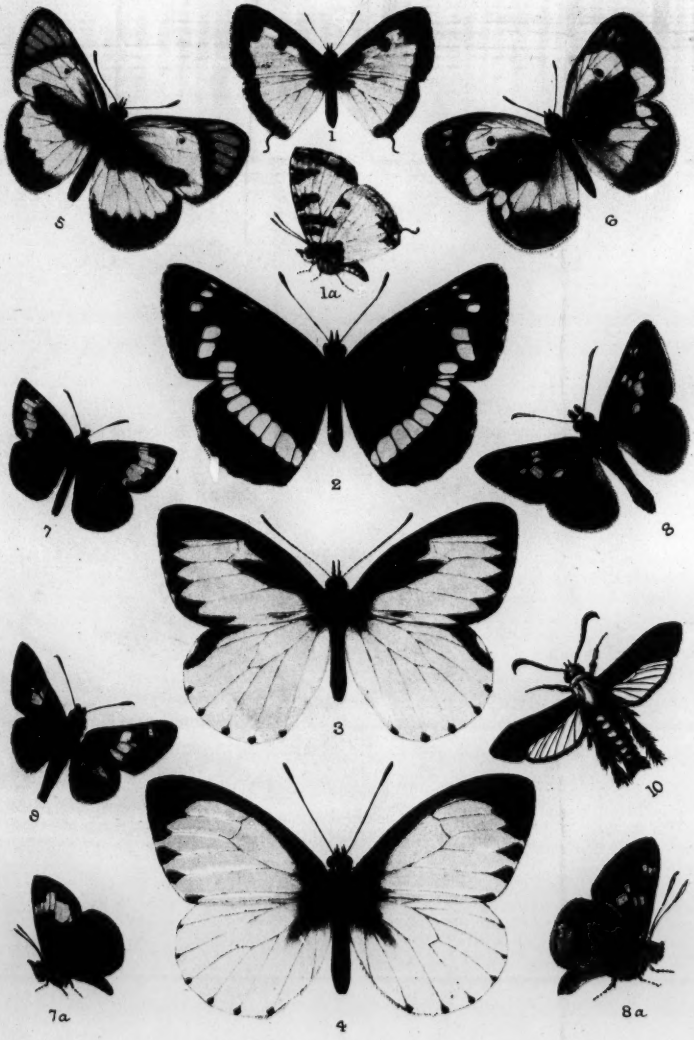
[Received December 11, 1895.]

Many of the specimens in the present consignment from Mr. Crawshay, who remains for the present at his station, Deep Bay, on the west coast of Lake Nyasa[1], were obtained at considerable altitudes, and therefore are of special interest. The only surprising thing is that comparatively few of the species prove to be undescribed, though some of the novelties which are in the collection are of exceptional interest, such as a *Neptis* representing a new section in the genus, a pure white species of *Hyreus*, a *Mylothris* which marvellously resembles *Phrissura lasti*, and a very beautiful new species of *Melittia*. Nine species altogether are described as new.

The novelties are, however, not the only species of interest in this collection, for it contains the rare Satyrid *Aphysoneuria pigmentaria*, previously unrepresented in the Museum; a variety of *Acræa johnstoni*, which we required; the female of *Acræa vinidia*, var. *tenella*; specimens of *A. anacreon* tending to link it to *A. bomba* (a seasonal form of it); a second example of *A. periphanes* (seasonal form of *A. guillemei*); examples of *Alæna nyassæ*, proving that I was correct in speaking of the buff form as a variety; specimens of *Catochrysops glauca*, a very beautiful Lycænid new to the Museum series; the true female of *Castalius hintza*, proving my *C. resplendens* to be a distinct species; specimens of *Durbania hildegarda*, of which we previously only possessed one poor example; *Larinopoda peucetia*, of which the type alone existed in the Hewitson cabinets; examples of *Uranothauma crawshayi* in both sexes; the female of *Epamera sidus*, new to the collection; both sexes of *Teracolus opalescens*; the male of *T. mutans*, which was previously unknown; variations of *Cyclopides quadrisignatus*; the female of the rare Hesperid *Kedestes capenas*; specimens of *Padraona watsoni*, linking that species to *P. zeno*; and the male of *Icterodes roseovittata*, which was previously undescribed.

As with other collections obtained by Mr. Crawshay, most of the specimens are in good condition, and therefore easily identified: with the exception of two or three specimens (the descriptive notes of which may have been lost when they were mounted, or may never have been written on the envelopes) all were carefully labelled with the exact locality, date of capture, a popular name

[1] About 10° 50′ S. lat. See map attached to Sir H. H. Johnston's paper, Geogr. Journ. v. p. 193 (1895).



F.C.Knight del et lith. West, Newman chromo

New Lepidoptera from Nyasa-land.

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descriptive of the insect, and any other note of interest which occurred to Mr. Crawshay at the time.

The following is a list of the species in this consignment:—

RHOPALOCERA.

1. NEOCÆNYRA YPTHIMOIDES.

Neocœnyra ypthimoides, Butler, P. Z. S. 1893, p. 646.

♂, Kondowi, Lower Nyika, W. of Lake Nyasa, 5th April, 1895.

♀, Lower Nyika, Feb. 2nd, 1895.

The male is noted as "Black Ringlet" and the female as "Black Ringlet with eyes," the ocelli being larger in this sex.

2. SAMANTA PERSPICUA.

Mycalesis perspicua, Trimen, Trans. Ent. Soc. London, 1873, p. 104, pl. i. fig. 3.

♀, Kambwiyi, Lower Nyika, Jan. 21st, 1895.

♀, Lower Nyika, Feb. 2nd.

"Dusky Ringlet" (*R. C.*).

3. MYCALESIS RHACOTIS.

Mycalesis rhacotis, Hewitson, Exot. Butt. iii. *Myc.* pl. viii. fig. 50 (1866).

♂ ♂, Henga, W. of Lake Nyika, Feb. 1st, 1895.

"Black Ringlet" (*R. C.*).

4. PHYSCÆNURA PIONE.

♀. *Physcœnura pione*, Godman, P. Z. S. 1880, p. 183, pl. xix. figs. 2, 3; ♂. Trimen, *l. c.* 1894, p. 20, pl. iv. fig. 1.

♂ ♀. *Periplysia johnstoni*, Butler, P. Z. S. 1893, p. 647, pl. lx. fig. 1, ♂.

♀ ♀, Mtambwi Hill, Deep Bay, west coast of Lake Nyasa, April 3rd, 1895.

"Black and white Heath" (*R. C.*).

5. YPTHIMA DOLETA, var.

Ypthima doleta, Kirby, Proc. Royal Dubl. Soc. 1879, separate copy p. 44.

♂, Henga, W. of Lake Nyika, Feb. 1st, 1895.

"Brindled Heath" (*R. C.*).

A single male, probably representing the dry-season form of this species; it differs chiefly from the typical form in its inferior size and the minute ocelli of the under surface.

6. APHYSONEURIA PIGMENTARIA.

Aphysoneuria pigmentaria, Karsch, Ent. Nachr. xx. p. 191 (June 1894).

Rhaphiceropsis pringlei, E. M. Sharpe, P. Z. S. (Aug. 1894), p. 336, pl. xix. figs. 1, 2.

Kondowi, Lower Nyika, April 6th and 11th, 1895.

This species is new to the Museum series; two examples were obtained, one in very good condition, the other somewhat worn. Mr. Crawshay calls it the "Black-and-white Glade Butterfly."

7. CHARAXES DRUCEANUS.

Charaxes druceanus, Butler, Cist. Ent. i. p. 4 (Oct. 1869); Lep. Exot. p. 26, pl. x. fig. 4.

♂, Nyankowa Mt., 5575 feet alt., Nyika, April 10th, 1895.

The single specimen obtained is the most perfect I have ever seen, but its chief interest lies in the fact that the markings on the under surface of the wings are somewhat aberrant; the differences, if constant, would serve to distinguish it as a species, but the female received from Zomba shows transitional characters. Mr. Crawshay notes this as the "Burnt-umber and Silver Swallow-tail," but it is one of the "Emperor" group.

8. JUNONIA SESAMUS.

Precis sesamus, Trimen, South Afr. Butt. i. p. 231, pl. iv. fig. 3 (1887).

Kondowi, 4110 feet alt., Lower Nyika, March 1895 (taken by M. Moffat, Esq., of the Livingstone Mission); Cheni-Cheni Mt., 6430 feet alt., Nyika, April 17th; Kambwiyi, 3800 feet alt., Lower Nyika, April 20th.

"Violet, scarlet, and black Tortoiseshell" (*R. C.*).

9. JUNONIA CHAPUNGA.

Junonia chapunga, Hewitson, Exot. Butt. iii. *Jun.* pl. i. figs. 2, 3 (1864).

♂, Nyankowa Mt., 5576 feet alt., Nyika, April 10th, 1895.

"Black scarlet-beaded Admiral" (*R. C.*).

10. JUNONIA TRIMENII.

Junonia trimenii, Butler, P. Z. S. 1893, p. 651, pl. lx. fig. 4.

♀, Mtambwi, foot of Nyika plateau, W. of Lake Nyasa, Feb. 4th, 1895.

"Salmon-coloured Tortoiseshell" (*R. C.*).

11. JUNONIA SIMIA.

Precis simia, Wallengren, Kongl. Svenska Vetensk.-Akad. Handl. 1857, p. 26.

♂, Lumpi R., Lower Nyika, W. of Lake Nyasa, Feb. 2nd, 1895.

"Small Tortoiseshell" (*R. C.*).

12. JUNONIA CALESCENS.

Junonia calescens, Butler, P. Z. S. 1893, p. 652.

♂, Watisi, Lower Nyika, Jan. 21st, 1895.

"Scarlet and black Tortoiseshell" (*R. C.*).

13. JUNONIA CERYNE.

Salamis ceryne, Boisduval, Faun. Madag. p. 46 (1833).

♂ ♂, Henga, west of Lake Nyasa, Feb. 1st, 1895.
"British (!) Tortoiseshell" (*R. C.*).

The trivial name is a curious one; there is certainly no British species of *Junonia*: memory is a treacherous reed to lean upon.

14. JUNONIA AURORINA.

Junonia aurorina, Butler, P. Z. S. 1893, p. 651, pl. lx. fig. 3.

♂, Kondowi, Lower Nyika, April 5th, 1895.
"Black and orange Tortoiseshell" (*R. C.*).

Prof. Aurivillius considers that *J. aurorina*, *J. milonia*=*kowara*, *J. sinuata*, and *J. tugela* may all be races or local forms of one species. This is one of the very few points in which I differ from this admirable Lepidopterist. I think it possible that *J. milonia* and *J. sinuata* may be seasonal forms of one species, and *J. tugela* and *J. aurorina* of another allied species; but I do not see my way at present to uniting the western and eastern species, which appear to be constant. Prof. Aurivillius proposes to regard *J. pyriformis* as a fifth development of the species, but as both the western and eastern forms are already provided with probable dry and wet-season races it would be puzzling to discover under what category to place this singularly formed type: that it is constant in its proper locality seems to be demonstrated conclusively by our seven examples; but it is not safe to dogmatize about the constancy of African Lepidoptera, and therefore I do not say that transitional links will not be discovered, which may eventually unite it to *J. aurorina*, though, at present, I do not believe that such links exist.

15. JUNONIA CLOANTHA.

Papilio cloantha, Cramer, Pap. Exot. iv. pl. cccxxxviii. A, B (1782).

♂ ♂, Henga, W. of Lake Nyasa, Feb. 1st, 1895.
"Hirsute underwinged Tortoiseshell" (*R. C.*).

16. JUNONIA ELGIVA.

Junonia elgiva, Hewitson, Exot. Butt. iii. *Jun.* pl. i. fig. 1 (1864).

♂, Ngerenge, W. coast of Lake Nyasa, Feb. 27th, 1895.
"Old-gold and black Admiral" (*R. C.*).

17. JUNONIA BOÖPIS.

Junonia boöpis, Trimen, Trans. Ent. Soc. London, 1879, p. 331.

♂, Henga, W. of Lake Nyasa, Feb. 1st, 1895.
"Blue underwinged Admiral" (*R. C.*).

18. JUNONIA CEBRENE.

Junonia cebrene, Trimen, Trans. Ent. Soc. London, 1870, p. 353.

♂ ♂, Henga, Jan. 25th, and Ngerenge, Feb. 24th.
"Light brown and black Admiral" (*R. C.*).

19. PYRAMEIS CARDUI.

Papilio cardui, Linnæus, Faun. Suec. p. 276 (1761).

♂, Chilindi (8 miles S. of Karonga), W. coast of Lake Nyasa, March 1st, 1895.

"Painted Lady" (*R. C.*).

20. HYPANARTIA SCHŒNEIA.

Eurema schœneia, Trimen, Trans. Ent. Soc. London, 1879, p. 329.

♂, Nyankowa Mt., 6500 ft. alt., April 9th, 1895.

"Scarlet Admiral" (*R. C.*).

The colouring of *Hypanartia* must be very fugitive; for specimens never come to hand with scarlet bands. As I have already suggested, this will probably prove to be a seasonal form of *H. hippomenes*.

21. PSEUDARGYNNIS HEGEMONE.

Argynnis hegemone, Godart. Enc. Méth. ix. p. 258 (1819).

Jaera duodecimpunctata, Snellen, Tijd. voor Ent. 2nd ser. part 7, pl. i. figs. 1, 2 (1872).

♂, Kondowi, Lower Nyika, W. of Lake Nyasa, April 5th; ♀, Kondowi, 4110 feet alt., April 11th, 1895.

"Silver-tipped Fritillary. ♀ full of bright green eggs" (*R. C.*).

Nyasa-land appears to be the headquarters of this rare butterfly, which for many years was unrepresented in the Museum collection; it never comes in numbers, but collections from Nyasa usually contain one or, rarely, two examples, and, as a rule, of the male sex.

22. HAMANUMIDA DÆDALUS.

Papilio dædalus, Fabricius, Syst. Ent. p. 482 (1775).

♂, Lower Nyika, W. of Lake Nyasa, Feb. 2nd, 1895.

"Dark grey and white Fritillary" (*R. C.*).

23. NEPTIS AGATHA.

Papilio agatha, Cramer, Pap. Exot. iv. pl. cccxxvii. A, B (1782).

♂, Henga, W. of Lake Nyasa, Jan. 30th; ♀, Cheni-Cheni Mt., 5700 feet alt., Nyika, April 17th, 1895.

"White Admiral. ♀ full of bright green ova" (*R. C.*).

24. NEPTIS INCONGRUA, sp. n. (Plate VI. fig. 2.)

♀. Upper surface dark olivaceous brown, the fringes black at the extremities of the veins, white between them: primaries with a minute subcostal white point near the end of the cell, two (elongated) immediately beyond the cell, and a fourth below the latter in the lower radial interspace; seven white spots in three groups crossing the disc much as in *N. marpessa*—three subapical (the first small), two on the median interspaces, and two, separated by the submedian vein, near external angle: secondaries crossed beyond the middle by a tolerably regular white belt, separated by

the nervures into eight spots, the first of which is smallest: body black; head, collar, and front of pterygodes spotted with white. Under surface much paler than above, bronze-brown, with a paler triangular patch at centre of outer margin of all the wings, and with the costal area of secondaries paler to just beyond the white belt; primaries with three white spots forming an elongated triangle in the cell, four in a semicircle beyond the cell, and seven crossing the disc as above, but larger; belt of secondaries as above; pectus black, spotted with white and clothed with tawny hair; venter fuliginous, with sordid white central stripe; legs striped with white longitudinally. Expanse of wings 59 millim.

Kantorongondo Mt., 15,900 feet alt., Nyika; April 15th, 1895.

"Black and white Admiral. Grass-green ova" (*R. C.*).

This extraordinary species is represented by a single example, the wings of which on one side are badly shattered; it does not appear to be nearly related to any other species in the genus, but perhaps should form a distinct section next to *N. marpessa*, though in some respects it more nearly resembles the Australian *N. shepherdi*.

25. ATELLA COLUMBINA.

Papilio columbina, Cramer, Pap. Exot. iii. pl. ccxxxviii, A. B; iv. pl. cccxxxvii. D, E (1782).

♂, Henga, W. of Lake Nyasa, Jan. 28th, 1895.

"Common old-gold Fritillary" (*R. C.*).

26. BYBLIA VULGARIS.

Hypanis ilithyia, var. *vulgaris*, Staudinger, Exot. Schmett. p. 106.

♂, Mtambwi, foot of Nyika plateau, Feb. 4th, 1895.

"Reddish-brown Wall" (*R. C.*).

This is the form which I have hitherto regarded as *B. acheloia*; but Prof. Aurivillius has pointed out to me that *B. cora* is that race, a much rarer form, having the under surface of the secondaries belted with dull reddish argillaceous. *B. vulgaris* differs very little from *B. goetzius* of Herbst. The species of *Acræinæ* in the present collection are, as usual in African series, well represented, and in the present instance are of exceptional interest to us.

27. ACRÆA JOHNSTONI.

♂. *Acræa johnstoni*, Godman, P. Z. S. 1885, p. 537; ♀. Butler, P. Z. S. 1888, p. 91.

Var. *semialbescens*, Oberth.:

♂ ♂, Nyankowa Mt., Nyika, April 10th; Kondowi, 4110 feet alt., Lower Nyika, April 12th, 1895.

Var. *flavescens*=*kilimandjara*, Oberth.:

♂ ♂, Kondowi, April 6th and 12th, 1895.

"Black and white Fritillary. Flies high, generally far out of reach" (*R. C.*).

No two examples of this species are absolutely alike, and thus the unfortunate creature has received the following names since Mr. Godman first made it known:—M. Oberthür calls it *A. proteina*, *flavescens*, *semifulvescens*, *fulvescens*, and *semialbescens*; Herr Rogenhofer calls it *A. telekiana*, *confusa*, and *fallax*; and Herr Karsch denominates it *A. octobalia*: the species thus has ten names; it divides itself very vaguely into four varieties, as follows:—

1. *A. johnstoni*, in which the sexes differ greatly; the typical male is described by M. Oberthür as *A. semifulvescens*, and the typical female as *A. proteina*.

2. *A. fulvescens*, Oberth. = *A. telekiana*, Rghfr.

3. *A. semialbescens*, Oberth.

4. *A. flavescens* (if a male) = *A. kilimandjara*, Oberth. = *A. confusa* and *A. fallax*, Rghfr., and *A. octobalia*, Karsch.

In the last-mentioned form both sexes have adopted the female dress; but the male sometimes has the spots on the primaries yellowish.

Acræa is a very variable genus, and it has been the custom of lepidopterists to regard all the different phases of each species as distinct; the genus, when properly studied, reduces itself to about a third of its supposed magnitude. The triangular black apical patch, which has been made to serve as a specific character in several instances, is of no value whatever, being a purely individual characteristic dependent on presence or absence of moisture.

28. Acræa cabira.

Acræa cabira, Hopffer, Ber. Verh. Akad. Berlin, 1855, p. 640; Peters' Reise n. Mossamb. p. 378, pl. 23. figs. 14, 15 (1862).

♂ ♂, Chifumya, Lower Nyika, 20th April; ♀, Munchewi R., Lower Nyika, April 8th, 1895.

"Yellow and black Fritillary. ♀ full of orange-coloured ova" (*R. C.*).

29. Acræa vinidia.

Acræa vinidia, Hewitson, Ent. Month. Mag. xi. p. 130 (1874); Exot. Butt. v. *Acr.* pl. 7. figs. 45, 46 (1875).

Var. *Acræa acerata*, Hewitson, Ann. & Mag. Nat. Hist. ser. 4, vol. xiii. p. 381 (1874); Exot. Butt. v. *Acr.* pl. 7. fig. 44 (1875).

Albino: *Acræa tenella*, Rogenhofer, Ann. Hof. Mus. Wien (1891).

Acræa abbotii, Holland, Entomologist, Suppl. xxv. (1892).

♀, Ngerenge, W. coast of Lake Nyasa, Feb. 27th, 1895.

"Pale orange and black Fritillary" (*R. C.*).

This species, like most of the *Acrææ*, is very variable, and especially in the female sex; the present example is straw-yellow, with the normal black border, subapical bar, and basal marking; it may therefore stand as the female of the albino form *A. tenella*, a male example of which we have from Kilima-njaro.

As an example of the inconsistency of those lepidopterists who have been styled "Lumpers," Hewitson's separation of two palpable forms of the present species is noteworthy.

30. ACRÆA EXCELSIOR.

Acræa excelsior, E. M. Sharpe, P. Z. S. 1891, p. 192, pl. xvii. fig. 3.

♂ ♂, Kondowi, Lower Nyika, W. of Lake Nyasa, April 4th and 6th; ♀ ♀, Nyankowa Mt., 6500 feet alt., April 9th; ♂, Lumpi R. valley, Lower Nyika, April 21st, 1895.

"Deep-bordered orange and black Fritillary" (*R. C.*).

This rare species is one of the most beautiful in the genus.

31. ACRÆA VENTURA.

Acræa ventura, Hewitson, Ent. Month. Mag. xiv. p. 51 (1877).

♂, Lumpi R., Lower Nyika, W. of Lake Nyasa, Feb. 2nd; ♀, Nyankowa Mt., 5575 feet alt., Nyika, April 10th, 1895.

"Orange and black Fritillary."

32. ACRÆA SERENA, var. BUXTONI.

Acræa buxtoni, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xvi. p. 395 (1875).

♂ ♂, Deep Bay, W. coast of Lake Nyasa, Feb. 14th, and Ngerenge Plains, W. coast of Lake Nyasa, Feb. 24th, 1895.

"Small orange and black Fritillary" (*R. C.*).

Whether this is a race or a sectional form of *A. serena* can only be decided by breeding it; but with our present extensive series I find it impossible to regard the following as distinct species:—*A. serena* = *eponina* = *janisca* = *rougetii* = *manjaca* = *buxtoni* = *perrupta* = *balina*. Probably the Linnean name *terpsichore* should stand over *A. serena*, but there is so much doubt connected with the identification of that species that the better-known name seems preferable at present.

33. ACRÆA LYCIA, var. SGANZINI.

Acræa sganzini, Boisduval, Faune Madag. p. 34, pl. vi. figs. 6, 7 (1833).

♂, Mrali, W. coast of Lake Nyasa, March 2nd, 1895.

"Lesser speckled brown and white Fritillary" (*R. C.*).

A. lycia separates roughly into three forms, which are linked together by numerous intergrades; they are—

1. *Acræa sganzini*, vaguely resembling *Limnas chrysippus*.
2. *Acræa daira* = *usagaræ*, like 1, but wanting black at apex.
3. *Acræa lycia* = *braunei*, pattern of 1, ground-colour white.

Every link between these varieties is now represented in the Museum collection. *A. daira* appears to be an Eastern and Central-African sport of the species, occurring together with the two normal forms; it is completely linked to the *A. sganzini* type by intergrades, and therefore cannot be regarded as a race of

the species. All that can be said is, that in Central and Eastern Africa a variety occurs which (in its extreme development) has been named *A. daira*.

34. ACRÆA ANACREON.

Acræa anacreon, Trimen, Trans. Ent. Soc. London, 1868, p. 77, pl. vi. figs. 3–5.

♂. Var. *Acræa bomba*, H. G. Smith, Ann. & Mag. Nat. Hist. ser. 6, vol. iii. p. 128 (1880); Rhop. Exot. i. *Acr.* pl. iii. figs. 5, 6 (1892).

Acræa induna, Trimen, Trans. Ent. Soc. 1895, p. 184, pl. 5. figs. 3, 3 *a*.

♂, Nyankowa Mt., 5575 feet alt., Nyika, April 10th; Kantorongondo Mt., 7305 feet alt., Nyika, April 16th; ♀, Cheni-Cheni Mt., 7225 feet alt., Nyika, April 17th, 1895.

Intermediate grades to *A. bomba*:

♂ ♂, Nyankowa Mt., 5575 ft. alt., Nyika, April 9th and 10th; Kantorongondo Mt., 7305 feet alt., Nyika, April 16th.

We received a typical female of *A. bomba* (but somewhat melanistic) from Zomba; it is the species referred to P. Z. S. 1895, p. 262, n. 45. The black apical area and the width of the band on under surface of secondaries are both variable characters of no specific importance.

35. ACRÆA GUILLEMEI.

♂. *Acræa guillemei*, Oberthür, Études, livr. xvii. p. 19, pl. 1. fig. 1 (1893); ♀. Butler, P. Z. S. 1893, p. 658.

Var. ♂. *Acræa periphanes*, Oberthür, *l. c.* p. 20, pl. 2. fig. 23 (1893).

Var. *periphanes*.

♂, Henga, W. of Lake Nyasa, Jan. 22nd, 1895.

"Scarlet black-spotted and black-tipped Fritillary" (*R. C.*).

This is a rare variety of *A. guillemei*, differing in nothing excepting the broad black apical patch of the primaries—a variation which crops up in a great number of species and is, doubtless, seasonal.

36. ACRÆA DOUBLEDAYI.

Acræa doubledayi, Guérin, Lefebvre's Voy. en Abyss. vi. p. 378 (1847).

Acræa oncæa, Hopffer, Peters' Reise n. Mossamb. v. pl. 24. figs. 5–8 (1862).

Acræa axina, Westwood in Oates's Matabele-Land, p. 344, pl. F. figs. 5, 6 (1881).

Var. *Acræa dircæa*, Westwood, l. c. p. 348.

♀. *Telchinia nero*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 102 (1883).

♂, Lumpi R., Lower Nyika, W. of Lake Nyasa, Feb. 2nd, 1895.

"Small speckled Fritillary" (*R. C.*).

Var. *dircæa*:

Henga, W. of Lake Nyasa, Feb. 1st, 1895.

"Rose and black white-tailed Fritillary" (*R. C.*).

This form varies, not only in the width of the black apical patch of primaries, the position of the second spot of the central transverse series, the width of the black border of the secondaries with its more or less defined submarginal spots, but, curiously enough, the terminal two-fifths of the abdomen may be either ochreous or snow-white. As in the variety *axina* (♀, *nero*) the submarginal spots of the primaries are wanting. The specimen now received bears a strong general resemblance to *A. natalica*.

In his paper, published in the 'Proceedings' for 1891, Mr. Trimen lays stress upon the absence of the submarginal spots as a good character for the discrimination of *A. axina* from *A. doubledayi*: I am sure that his earlier decision was the correct one, and that this character cannot be relied upon; in *A. cæcilia*, var. *stenobœa* (♀ = *ligus* = *albomaculata*) the submarginal spots are sometimes present, sometimes absent[1].

37. Acræa natalica.

Acræa natalica, Boisduval, Voy. de Deleg. p. 590 (1847).

♂ ♀, Foot of Jakwa Mt., Henga-Nkamanga, W. of Lake Nyasa, Jan. 28th and 29th; ♂, Mtambwi, foot of Nyika plateau, Feb. 4th, 1895.

♂, "Rose and black Fritillary"; ♀, "Dusky Fritillary" (*R. C.*).

With our present extensive series it is impossible to keep *A. pseudegina* distinct from *A. natalica*, of which it is only the Western phase, the two extremes are completely linked by intergrades.

38. Acræa caldarena.

Acræa caldarena, Hewitson, Ent. Month. Mag. xiv. p. 52 (1877).

♂ ♀, taken *in coitu*, Kondowi, Lower Nyika, April 6th, 1895.

I gave the correct synonymy of this species (if species it be) in the 'Proceedings' for 1893, p. 657. I, however, strongly suspect it to be merely a seasonal development of *A. cæcilia*, var. *stenobœa*, from which it chiefly differs in the broad black apical patch on the primaries.

39. Acræa asema.

Acræa asema, Hewitson, Ent. Month. Mag. xiv. p. 52 (1877); Trimen, P. Z. S. 1894, p. 24, pl. iv. figs. 3, 3 *a*.

Acræa empusa, Butler, P. Z. S. 1893, p. 656.

Acræa omrora, Trimen, P. Z. S. 1894, p. 24, footnote.

♀, Lumpi R., Lower Nyika, Feb. 2nd, 1895.

"Small speckled Fritillary" (*R. C.*).

[1] My identification of *A. stenobœa* with a S.-African male of *A. ligus* was confirmed by Prof. Aurivillius during his recent visit (Aug. 1895).

This species varies in tint, from semitransparent greyish bone-colour to almost opaque orange tawny; the spots vary in number and size, and the apical border of primaries in width: it is this inconstancy in the present species which convinces me that *A. stenobœa=ligus* is only a bright-coloured and more opaque phase of *A. cœcilia*.

40. Acræa anemosa.

Acræa anemosa, Hewitson, Exot. Butt. iii. pl. 8. figs. 14, 15 (1865).

Acræa arcticincta, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 103 (1883).

♂. Ndara, W. coast of Lake Nyasa, March 2nd, 1895.

"Orange and black, crimson and pink underwinged Fritillary. Have only seen this one specimen" (*R. C.*).

This is a very variable species; not only does it differ greatly in the width of the black border of secondaries (on which character I based my *A. arcticincta*), but in the size and number of the black spots on the primaries. One of our 31 examples, in addition to the basal black patch, the bar beyond the end of cell, and the apical patch, exhibits five well-defined discal black spots, all of which are absent in some specimens, it also shows a conspicuous black spot on the lower discocellular veinlet.

The Lycænidæ of the collection contain a nice series of the new genus *Uranothauma* and several other forms of interest.

41. Alæna nyassæ.

Alæna nyassæ, Hewitson, Ent. Month. Mag. xiv. p. 6 (1877).

Lumpi R., Lower Nyika, Feb. 2nd; Mtambwe Hill, Deep Bay, April 3rd; Manchewi Falls, Lower Nyika, April 6th; Lumpi Valley, April 13th, 1895.

"Marbled white Skipper" (*R. C.*).

These specimens are interesting, three of them being white-banded as in typical *A. nyassæ*, but with the subapical white spot of var. *ochracea*; the fourth example has a white band across the primaries, but a buff band across the secondaries, thus proving that I was correct in not regarding *A. ochracea* as a distinct species.

42. Polyommatus bæticus.

Papilio bœticus, Linnæus, Syst. Nat. i. 2, p. 789 (1767).

♀, Kapoio, Songwi R. plain, W. coast of Lake Nyasa, Feb. 26th; ♀, Nyankowi Mt., Nyika, 5575 feet alt., April 9th; ♂ ♀ *in coitu*, April 10th; ♂, Kwereru Hill, Deep Bay, April 22nd, 1895.

♂, "Alexis-like Blue"; ♀, "Dull azure Blue" (*R. C.*).

43. Catochrysops osiris.

Lycæna osiris, Hopffer, Ber. Verh. Ak. Berlin, 1855, p. 642; Peters' Reise n. Mossamb. v. p. 409, pl. 26. figs. 11, 12 (1862).

♂, Lumpi R. valley, Lower Nyika, April 21st, 1895.

44. CATOCHRYSOPS HIPPOCRATES.

Hesperia hippocrates, Fabricius, Ent. Syst. iii. p. 288 (1793); Donovan, Ins. Ind. pl. 45. fig. 3 (1800).

♂, Lower Nyika, W. of Lake Nyasa, Feb. 2nd, 1895.

A rare western form, which I have not previously seen from Central Africa.

45. CATOCHRYSOPS GLAUCA.

Lycæna glauca, Trimen, South Afr. Butt. vol. ii. p. 21 (1887).

♂ ♂, Kwereru Hill, Deep Bay, April 22nd, 1895.

"Chalk-hill Blue. A frequenter of open forest, very active and restless and difficult to capture" (*R. C.*).

This very beautiful species is quite new to us: in its pale glittering yellow-greenish tint it stands out distinct from all the other species of the *C. parsimon* group.

46. EVERES JOBATES.

Lycæna jobates, Hopffer, Ber. Verh. Ak. Berlin, 1855, p. 642; Peters' Reise n. Mossamb. v. p. 408, pl. 26. figs. 9, 10 (1862).

♀, Upper Leya, six miles N.W. of Deep Bay, March 3rd, 1895.

"Orange-lower-wing Blue. Very restless" (*R. C.*).

The finest example I have seen of this somewhat rare species.

47. AZANUS SIGILLATUS.

Lampides sigillata, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 483 (1876).

♂ ♂, Mrali, W. coast of Lake Nyasa, March 2nd, 1895.

"Lesser Alexis-like Blue" (*R. C.*).

A rare form of the *A. gamra* group, originally described from a pair received from Abyssinia; one of the examples obtained by Mr. Crawshay agrees in all respects with *A. natalensis*, Trimen, which will therefore have to sink as a synonym of my species.

48. TARUCUS PLINIUS.

Hesperia plinius, Fabricius, Ent. Syst. iii. 1, p. 284 (1793).

Lycæna pulchra, Murray, Trans. Ent. Soc. London, 1874, p. 524, pl. 10. figs. 7, 8.

♀, Foot of Jakwa Mt., Henga-Nkamanga, W. of Lake Nyasa, Jan. 28th; ♂, Mrali, W. coast of Lake Nyasa, March 2nd; ♂, Nyankowa Mt., Nyika, April 10th; ♀, Cheni-Cheni Mt., 4500 feet alt., Nyika, April 18th; ♂ ♀, Lumpi R. valley, Lower Nyika, April 21st, 1895.

Mr. Crawshay calls the male "Double peacock-spotted hair-tailed Blue," and the female "Peacock-eyed double-tailed Blue" and "Chequered double peacock-eye Blue."

The species is very common and varies a good deal.

49. CASTALIUS HINTZA.

Lycæna hintza, Trimen, Trans. Ent. Soc. London, ser. 3, vol. ii. p. 177 (1864); Rhop. Afr. Austr. ii. p. 243 (1866).

♀, Chikunguru, Lower Nyika, April 20th, 1895.

"Black and white chequered violet-tinged Blue" (*R. C.*).

This species differs from my female *C. resplendens* on both surfaces, the secondaries of the Abyssinian form being crossed from apex to inner margin by a continuous band above, the markings on the under surface being also more regular, those crossing the disc forming a regular zigzag: the female before me corresponds with a male from Balapye, Kama's Country, and is doubtless the true *C. hintza*; but *C. resplendens* appears to be a distinct though allied form.

50. CASTALIUS CALICE.

Lycæna calice, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 642; Peters' Reise n. Mossamb. v. p. 405, pl. 26. figs. 4, 5 (1862).

♀, Henga, W. of Lake Nyasa, Jan. 30th, 1895; Cheni-Cheni Mt., 4500 feet alt., Nyika, April 18th; ♂ ♀, Chikunguru, Lower Nyika, April 20th, 1895.

"Black-bordered tiny white Blue" (*R. C.*).

A rare species in collections.

51. LYCÆNESTHES ADHERBAL.

♀. *Lycæna adherbal*, Mabille, Bull. Soc. Zool. France, 1877, p. 217.

♂. *Lycænesthes lunulata*, Trimen, P. Z. S. 1894, p. 51, pl. vi. fig. 12.

♀, Kambwiyi, 3800 feet alt., Lower Nyika, April 20th, 1895.

"Three-tailed Blue" (*R. C.*).

The finest example which has hitherto come to hand of this beautiful species.

52. ZIZERA GAIKA.

Lycæna gaika, Trimen, Trans. Ent. Soc. London, 3rd ser. vol. i. p. 403 (1862).

♀, Mrali, W. coast of Lake Nyasa, March 2nd, 1895.

53. PLEBEIUS TROCHILUS.

Lycæna trochilus, Freyer, Neuere Beitr. v. pl. 440. fig. 1 (1844).

Lumpi R., Lower Nyika, Feb. 2nd; Kondowi, April 4th; Chiwayi, 3700 feet alt., April 20th, 1895.

"Tiny dark-coloured orange-spotted Blue" (*R. C.*).

54. DURBANIA HILDEGARDA.

♀? *Teriomima*? *hildegarda*, Kirby, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 367 (1887); Rhop. Exot. i. *Afr. Lyc.* pl. iv. figs. 7, 8 (1888).

Kondowi, Lower Nyika, 4110 feet alt., April 5th, 6th, and 11th, 1895.

Quite a new species to us; Mr. Crawshay calls it "Orange, black-barred Heath."

55. TINGRA AMENAIDA.

Pentila amenaida, Hewitson, Exot. Butt. v. *Pent.* & *Lipt.* pl. 2. figs. 4–7 (1873).

Kambwiyi, Lower Nyika, W. of Lake Nyasa, Jan. 21st; Mtambwi Hill, Deep Bay, W. coast of Lake Nyasa, April 3rd; Kondowi, April 5th, 1895.

"Orange and black-speckled" (*R. C.*).

56. LARINOPODA PEUCETIA.

Pentila peucetia, Hewitson, Exot. Butt. iii. *Pent.* & *Lipt.* pl. 1. fig. 3.

Lumpi Valley, Lower Nyika, April 13th, 1895.

"Black and white Wood-White with orange legs" (*R. C.*).

Previously unrepresented in the general Museum series, and in the Hewitson collection by the type specimen only.

57. LACHNOCNEMA BIBULUS.

Hesperia bibulus, Fabricius, Ent. Syst. iii. 1, p. 307. n. 163 (1793).

♂ ♀, Chilindi (8 miles S. of Karónga), W. coast of Lake Nyasa, Feb. 23rd; ♀, *var.*, Lumpi R. valley, 4000 feet alt., Lower Nyika, April 21st, 1895.

"Black and white silver-speckled underwing Blue" (*R. C.*)[1]. Var. *durbani*: "Fluffy Blue. ♀, orange ova" (*R. C.*).

Formerly it was supposed that the two types of female indicated distinct species, but they are probably temperature forms. Wherever the species occurs, both types are to be found; the present series contains typical females of *L. bibulus* and *L. durbani*.

58. HYREUS PALEMON.

Papilio palemon, Cramer, Pap. Exot. iv. pl. cccxc. E, F (1782).

Manchewi Falls, Lower Nyika, April 6th; Nyankowa Mt., 5425 feet alt., Nyika, April 8th; Kantorongondo Mt., 5900 feet alt., April 14th and 15th; Cheni-Cheni Mt., 4500 feet alt., April 18th, 1895.

"Silvery underwinged" and "Bronze-winged Blue. ♀, ova emerald-green" (*R. C.*).

59. HYREUS VIRGO, sp. n. (Plate VI. fig. 1.)

♀. Snow-white: primaries with the base, costal and external

[1] By some oversight the sexual marks are reversed on the label, the white-banded females being labelled as males, and the uniform male as female.

borders, a transverse patch over the discocellulars, and a macular subapical bar, sometimes confluent with the external border, black: secondaries with a black external border, its inner edge slightly irregular, two metallic-blue submarginal spots, between which at extremity of first median branch the usual tail, black tipped with white, is emitted; fringes spotted with white: body black, margins of eyes and a transverse line on the vertex white; antennæ ringed with white. Under surface pure white, with black markings nearly as in *H. juba*, but more sharply defined, the central irregular band across the secondaries only represented by a black Y-shaped costal patch, with the V portion filled in; the marginal border barely indicated, excepting towards anal angle, where the black spots touched with blue and green metallic scales are well-defined, as well as an irregular zigzag line at the back of them. Expanse of wings 33 millim.

♀ ♀, Cheni-Cheni Mt., 4500 feet alt., Nyika, April 18th, 1895.

"Black-bordered white Blue" (*R. C.*).

Two examples of this very fine species were obtained; one of which, however, was much shattered.

60. URANOTHAUMA CRAWSHAYI.

Uranothauma crawshayi, Butler, P. Z. S. 1895, p. 631, pl. xxxv. figs. 6, 7.

♂ ♂, Nyankowa Mt., 6500 feet alt., Nyika, April 9th, 1895; ♀, Kantorongondo Mt., 5900 feet alt., Nyika, April 15th; ♂, ♀ ♀, 6975 feet alt., April 16th, 1895.

"Giant Blue" (*R. C.*).

61. SPINDASIS CAFFER.

Aphnæus caffer, Trimen, Trans. Ent. Soc. London, 1868, p. 88, and 1870, p. 368.

Aphnæus natalensis, Hewitson (not Westwood), Ill. Diurn. Lep. p. 62, pl. xxv. figs. 1, 2 (1865).

♂, Henga, west of Lake Nyasa, Jan. 22nd, 1895.

"Orange and black-barred Blue" (*R. C.*).

In his 'South African Butterflies,' vol. ii. p. 150, Mr. Trimen follows Hewitson in regarding this as *S. natalensis* of Westwood—on the ground, principally, "of the large size of the orange anal-angular marking in the hind wing." We, however, possess what is clearly the original of the figure in the 'Genera,' a worn female with unusually large anal patch; it was obtained in 1846, labelled "*Thecla natalii*, Pt. Nat.," and agrees in all details of marking with the original figure. With regard to "the small development of the hind marginal lunulate whitish streak," also referred to by Trimen, the figure and specimen are both faulty, the latter being badly rubbed on one hind wing, and the same part broken away on the other; the imagination of Hewitson was not lively enough to enable him to supply this deficiency in the whitish streak.

62. Spindasis nyassæ.

Aphnæus nyassæ, Butler, Ent. Month. Mag. xx. p. 250 (1884); P. Z. S. 1894, p. 569, pl. xxxvi. fig. 4.

♂, Mrali, W. coast of Lake Nyasa, March 2nd; ♀, Henga, W. of Lake Nyasa, Feb. 1st, 1895.

"Orange and black-barred long-tailed Blue" (*R. C.*).

63. Axiocerses amanga.

Zeritis amanga, Westwood, in Oates's Matabele-Land, p. 351 (1881).

♂, Mtambwi, foot of Nyika plateau, Feb. 4th; Kwereru Hill, Deep Bay, April 22nd, 1895.

"Crimson-plush underwing Copper" and "Spike-winged Copper" (*R. C.*).

64. Axiocerses perion.

Papilio perion, Cramer, Pap. Exot. iv. pl. cclxxix. B, C (1782).

♀, Henga, Jan. 30th; ♂, Lumpi R., Feb. 2nd; ♂, Mrali, coast of Lake Nyasa, March 2nd, 1895.

♂, "Scarlet and black Copper"; ♀, "Dull red Copper" (*R. C.*).

65. Virachola anta.

Lycæna anta, Trimen, Trans. Ent. Soc. ser. 3, vol. i. p. 402 (1862).

♀, Ngerenge Plains, Feb. 24th; Chilindi (8 miles S. of Karonga), March 1st, 1895.

"Long-tailed curly-tufted Blue, black and orange spots" (*R. C.*).

66. Tatura buxtoni.

♀. *Hypolycæna buxtoni*, Hewitson, Ent. Month. Mag. x. p. 206 (1874).

♂ ♀. *Hypolycæna seamani*, Trimen, Trans. Ent. Soc. London, 1874, p. 332, pl. ii. figs. 3, 4.

♂ ♂, Lower Nyika, W. of Lake Nyasa, Feb. 2nd, 1895.

"Striped Blue with four tails" (*R. C.*).

A little larger than our solitary male from D'Urban.

67. Tatura cæculus.

Iolaus cæculus, Hopffer, in Peters' Reise n. Mossamb. p. 402, pl. xxv. figs. 12–14 (1862).

♀, Mtambwi, foot of Nyika plateau, Feb. 4th, 1895.

"Grey underwing striped Blue" (*R. C.*).

The largest example of the female that I have seen, and almost as bright in colouring as the male.

68. Epamera sidus.

Iolaus sidus, Trimen, Trans. Ent. Soc. London, 3rd ser. ii. p. 176 (1864); Rhop. Afr. Austr. ii. p. 224, pl. iv. figs. 5, 6 (1866).

♀, Kondowi, 4110 feet alt., Lower Nyika, Jan. 1895.

"Taken by M. Moffat, Esq., Livingstone's Mission, and given to me" (*R. C.*).

New to the general Museum series; unfortunately it has lost its abdomen.

Among the *Pierinæ*, Mr. Crawshay's collection contains several rare and interesting species.

69. MYLOTHRIS AGATHINA.

Papilio agathina, Cramer, Pap. Exot. iii. pl. ccxxxvii. D, E (1782).

♂, Henga, Feb. 1st; Mtambwi, Feb. 4th; Mrali, March 2nd; ♀, Vuwa sand-flats, W. coast of Lake Nyasa, March 3rd, 1895.

"Scallop-shell White" (*R. C.*).

70. MYLOTHRIS NARCISSUS, var. DENTATUS. (Plate VI. fig. 3.)

♂ ♀. *Mylothris narcissus*, Butler, P. Z. S. 1888, p. 95.

♂, Kantorongondo Mt., Nyika, 5900 feet alt., April 15th, 1895.

"Chrome-yellow underwing White" (*R. C.*).

The form now received differs from the typical male from Kilima-njaro in having the costal black border continuous, only interrupted by the upper discocellular veinlet; a diffused black streak in the cell above the median vein, the outer border acutely quinque-dentate; and sometimes a little oblique black streak below the submedian nervure and a broad apical black bar uniting the first two marginal spots of the secondaries: in some respects it more nearly resembles the typical female than the typical male does, while Miss Sharpe's *M. jacksoni* more nearly corresponds with typical male *M. narcissus*. Unless we have here three very closely allied species, it must be assumed that *M. narcissus* is dimorphic; a better series will doubtless solve the problem.

71. MYLOTHRIS CRAWSHAYI, sp. n. (Plate VI. fig. 4.)

A very perfect copy, in both sexes, of *Phrissura lasti*, and therefore intermediate in character between *M. narcissus* and *M. trimeni*: in size, form, and colouring the male resembles the latter, but the apical patch extends in an oblique curve from just beyond the cell to the third median branch, its inner edge being zigzag, the remaining marginal spots not included in this patch are hastate; the base of the wings is slightly more heavily blackened than in *M. trimeni* and the marginal spots of the secondaries reduced to mere points; on the under surface the apex of primaries and entire surface of secondaries are bright lemon-yellow instead of saffron-yellow. Expanse of wings 57–64 millim.

The female has pearl-white primaries, the cell, costal border, and base of internal border densely dusted with smoky grey; an oblong patch of the same colour at external angle; the apical area and outer border to below the first median branch smoky grey,

with sulphur-yellow internervular longitudinal lines; inner edge of border acutely zigzag: secondaries sulphur-yellow, with marginal rounded black spots: body normal, blue-blackish with yellow venter. Primaries below pearl-white, showing the upper surface pattern through the wing, apical border slightly washed with sulphur-yellow; a marginal series of black points: secondaries as above, excepting that the base of the costa is chrome-yellow: pectus whitish, with yellowish hairs. Expanse of wings 59 millim.

♂ ♂, ♀, Nyankowa Mt., 6500 feet alt., April 9th; ♂ ♂, Kantorongondo Mt., 5000 feet alt., Nyika, April 14th and 15th, 1895.

"Chrome-yellow underwing White. A high flier, perching on trees high up, but of weak flight" (*R. C.*).

72. Colias edusa, var. electra.

Papilio electra, Linnæus, Syst. Nat. i. 2, p. 764 (1767).

♂, Nyankowa Mt., 5425 feet alt., April 8th; ♂ ♀, 5575 feet, April 10th; ♂, Kantorongondo Mt., 5900 feet, April 15th; ♂ ♀, Cheni-Cheni Mt., 4500 feet alt., April 18th, 1895.

"Ova oblong and yellow" (*R. C.*).

The white female is only the ordinary *C. helice* form.

73. Terias chalcomiæta.

Terias chalcomiæta, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 190 (1879).

♀, Foot of Jakwa Mt., Henga-Nkamanga, Jan. 29th, 1895.

"Black-tipped light-chrome Yellow; ova oblong and sharp-pointed, not spherical" (*R. C.*).

This is probably a seasonal form of *T. senegalensis*.

74. Terias desjardinsii (seasonal form *T. regularis*).

Terias regularis, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 486 (1876).

♀, Henga, W. of Lake Nyasa, Jan. 24th, 1895.

"Black-bordered Yellow" (*R. C.*).

An interesting example of the female, showing the dotted margin to the secondaries characteristic of typical *T. desjardinsii*.

75. Teracolus opalescens.

♀. *Teracolus opalescens*, Butler, Ent. Month. Mag. xxiii. p. 30 (1886).

The male of this form has the black more largely developed than in any of the other members of the *T. eris* group, excepting perhaps *T. abyssinicus* (the male of which is unknown to me): the pattern of the primaries is almost the same as in *T. eris*, but the apex is more purple in tint with the spots upon it golden ochreous, the wings are moreover decidedly broader; the secondaries show a marginal series of well-defined black spots; the colouring below is milky white; the veins of the primaries tipped with black, the

first and second median branches terminating in black spots and the spots on the disc much larger; the secondaries show a broad bright saffron-yellow costal streak and a paler longitudinal submedian streak, and the nervures are tipped with black.

♂, Foot of Jakwa Mt., 3210 feet, Henga-Nkamanga, Jan. 29th; ♂ ♀, Henga, Jan. 30th and 31st, 1895.

♂, "Black and gold-tipped White"; ♀, "Black-tipped mother-of-pearl underwing White" (*R. C.*).

The female now received is smaller than the type from Delagoa Bay, and has a broader black internal border to the primaries (in which respect it more nearly corresponds with the male); but of a pair received from the Victoria Nyanza, this border in the female corresponds with that of the type. As more examples of these representatives of *T. eris* come to hand, the fact that they are true to locality seems to be gradually established on a firmer basis.

76. TERACOLUS MUTANS.

♀. *Teracolus mutans*, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 459 (1877).

♂. Nearly resembles *T. vesta* on the upper surface, but the base of the wings is dusted with bluish grey instead of black, the outer area creamy ochreous (less salmon-tinted than in *T. vesta*), pattern exactly as in the female, therefore much more yellow throughout than in *T. vesta*.

♂, Henga, west of Lake Nyasa, Feb. 1st, 1895.

"White-centred, yellow and black-mottled White. Difficult to take and not common" (*R. C.*).

The arrival of this male is especially interesting to me, as Prof. Aurivillius was inclined to believe my *T. rhodesina* to be the male of *T. mutans*, considering that the differences of pattern might be sexual: it is now satisfactorily proved that there is no difference of pattern between the sexes, but only in the colouring of the outer half of the upper surface[1]; precisely what might have been expected, from what we know of the sexes of *T. hanningtonii* and *T. amelia*.

77. TERACOLUS ANAX.

Callosune anax, H. G. Smith, Ann. & Mag. Nat. Hist. ser. 6, vol. iii. p. 125 (1889); Rhop. Exot. i. *Call.* pl. i. figs. 5–8 (1889).

Teracolus eliza, E. M. Sharpe, Ann. & Mag. Nat. Hist. ser. 6, vol. v. p. 441 (1890); Waterhouse, Aid, vol. ii. pl. 189. figs. 5, 6 (1890).

♂, Deep Bay, W. coast of Lake Nyasa, Feb. 7th, 1895.

"Violet-tipped White" (*R. C.*).

An especially well-marked specimen, with bold black spots on the under surface. It has recently been suggested that this may be a seasonal form of *T. regina*, of which Mr. Trimen formerly regarded it as a variety; the only odd thing is that typical

[1] This buff colouring is limited by the black band as in *T. vesta*.

T. regina does not come to hand from Central Africa. The collection made by Emin Pasha contained half a dozen examples of *T. anax*, but not one of *T. regina*; Mr. Crawshay's first collection, from Lake Mweru, contained one female *T. anax* and his present collection contains one male, again *T. anax*; but perhaps this form is the only one in Central Africa, and typical *T. regina* is only produced, as a second form, as the species ranges southwards.

78. TERACOLUS JALONE.

Euchloe jalone, Butler, Cist. Ent. i. p. 14 (1869).
Teracolus phegyas (part.), Butler, P. Z. S. 1893, p. 664.

♂, Henga, W. of Lake Nyasa, Jan. 25th, 1895.
"Purple-tipped black-veined White" (*R. C.*).

This form seems so rare that it may well be mistaken for *T. phlegyas*; in all probability it is the Nyasa form of that species.

79. TERACOLUS GAVISA.

♂. *Anthopsyche gavisa*, Wallengren, Kongl. Svensk. Vet.-Akad. Handl. 1857; Lep. Rhop. Caffr. p. 13. n. 6.

♀. *Anthopsyche omphale*, Wallengren, loc. cit. p. 11.

♂ ♀. *Teracolus subvenosus*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 105 (1885).

♂, Henga, Jan. 24th; ♀, Jan. 25th; ♀, foot of Jakwa Mt., Henga-Nkamanga, Jan. 29th; ♂ ♀ *in coitu*, Henga, Jan. 30th, 1895.

Mr. Trimen (South African Butterflies, iii. p. 135) says:—"Having examined the types of *subvenosus*, Butl., from Victoria Nyanza, I find the female inseparable from that of *T. gavisa*, while the male, though very near the corresponding sex of the species named, differs in wanting the inner black edging of the apical patch, and in the feeble development of the inner marginal blackish bar of the fore wings and the costal one of the hind wings." Although I do not admit that the type of *T. subvenosus* agrees absolutely with the typical female of *T. gavisa*, inasmuch as the oblique subapical bar on the front wings is much narrower in the latter, I am compelled by the receipt of many transitional specimens to agree with Mr. Trimen that my female is only a slight variety of Wallengren's, and, moreover, that my male is only a better-marked variety, though absolutely inseparable as a species. The series received from Dr. Gregory, taken in conjunction with the five examples in the present collection, renders the discrimination of the two forms *T. gavisa* and *T. subvenosus* simply hopeless.

Unless *T. hero* is another variety of *T. gavisa* (which I think possible), I am of opinion that the female of *T. sipylus* would be better placed under *T. hero* than under *T. gavisa*, the black veining of the under surface being barely noticeable; the whole of these forms might then sink under *T. achine*, *T. hyperides* being included as a starved form, though in some respects it more nearly resembles *T. helle*=a race of *T. antevippe*.

80. Teracolus infumatus, sp. n. (Plate VI. figs. 5, 6.)

Nearest to *T. arethusa*, the male with a similar but less angular orange or vermilion patch on the black apical area; the costa blackened almost to the base; the spot at the end of the cell larger, and a broad blackish streak along the inner margin as in some females of *T. arethusa*; the secondaries with a broad diffused blackish border, running inward along the nervures; base and costa almost to apex broadly blackish; body normal. Primaries below not yellow at base, but more so at apex; black discocellular spot larger, a broad internal grey streak ending in a blackish diffused spot: secondaries somewhat greyish at base, costal orange streak defined, black-dotted orange spot at end of cell larger; female with better-defined, though small, orange dashes on the apical area than in most females of *T. arethusa*; other black areas extended, so as more nearly to repeat the pattern of *T. gavisa* ♀, but only the two apical white spots on the border of secondaries large and well defined, the others small and greyish: below the colouring throughout is clearer and brighter than in *T. arethusa* and the primaries show a broad internal grey streak terminating in a blackish spot; the costal orange edging of the secondaries, as in the male, is bright and sharply defined. Expanse of wings, ♂ 44 millim., ♀ 42 millim.

♂ ♀, Henga, 24th, 26th, and 30th January, 1895.

"Dusky Orange-tip" (*R. C.*).

We have long had a single female of this very distinct species in the Museum collection, from Niomkolo, Lake Tanganyika, obtained in January 1890, and presented to the Museum by Alexander Carson, Esq.

81. Catopsilia florella.

Papilio florella, Fabricius, Syst. Ent. p. 479 (1775).

♀, Nyankowa Mt., Nyika, April 10th, 1895.

"Brimstone" (*R. C.*).

82. Belenois severina.

Papilio severina, Cramer, Pap. Exot. iv. pl. cccxxxviii. G, H (1782).

♂ ♀ *in coitu*, Henga, W. of Lake Nyasa, Jan. 22nd, 1895.

"Common black-bordered White" (*R. C.*).

83. Belenois mesentina, var. agrippina.

Pieris agrippina, Felder, Reise der Nov., Lep. ii. p. 173 (1865).

♀, Henga, Jan. 22nd; Ngerenge, W. coast of Lake Nyasa, Feb. 27th; ♂, Nyankowa Mt., 6500 feet alt., April 9th, 1895.

♂, "Common White"; ♀, "Deep black-bordered White" (*R. C.*).

The females show almost the deep yellow under-surface coloration of the form to which I gave the name of *B. auriginea*, but

the upper surface and both surfaces of the male are quite like typical *B. agrippina*: possibly the yellow on the under surface of the females may be seasonal; but if so it is characteristic of our winter months, the only awkward fact being that it reappears in July at Zomba; then, again, many specimens of the pale type were collected by the late Emin Pasha at Wadelai from January to March. Altogether the question of seasonal dimorphism in this species becomes very complicated.

84. HERPÆNIA ERIPHIA.

Pieris eriphia, Godart, Enc. Méth. ix. p. 157 (1819).

♂, Foot of Jakwa Mt., 3210 feet, Henga, Jan. 29th, 1895.
"Marbled White" (*R. C.*).

85. PAPILIO CORINNEUS.

Papilio corinneus, Bertoloni, Mem. Acc. Bologna, 1849, p. 9, pl. 1. figs. 1–4.

Henga, W. of Lake Nyasa, Jan. 28th, 1895.
"Mother-of-Pearl and Black" (*R. C.*).

86. TAGIADES FLESUS.

Hesperia flesus, Fabricius, Sp. Ins. ii. p. 135 (1781).

Manchewi Falls, Lower Nyika, April 6th; Lumpi R. valley, April 21st, 1895.
"Large grey-patched Skipper" (*R. C.*).

87. SAPÆA TRIMENII.

Sapæa trimenii, Butler, P. Z. S. 1895, p. 264, pl. xv. fig. 5.

♂ ♀. No label with specimens.

88. HESPERIA DROMUS.

Pyrgus dromus, Plötz, Mitth. naturw. Vereins, 1884, p. 6.

Mrali (25 miles N. of Deep Bay), W. coast of Lake Nyasa, Feb. 22nd; Kaporo, Songwe R. plains, Feb. 26; Deep Bay, March 16th, 1895.
"Black and white Skipper" (*R. C.*).

89. OXYPALPUS RUSO.

Pamphila ruso, Mabille, Comptes Rendus Soc. Ent. Belge, 1891, p. clxxxiii.

♂, Lumpi R. valley, Lower Nyika, April 21st, 1895.
"Orange and black barred Skipper" (*R. C.*).

90. OSMODES RANOHA.

Pamphila ranoha, Westwood, in Oates's Matabele-Land, p. 353 (1881).

♂, Lumpi R., Lower Nyika, Feb. 2nd, 1895.

91. HETEROPTERUS FORMOSUS.

Heteropterus formosus, Butler, P. Z. S. 1893, p. 670, pl. lx. fig. 8.

♂, Kondowi, 4110 feet alt., Lower Nyika, April 11th; Kambwiyi, 3800 feet alt., Lower Nyika, April 20th and Jan. 21st, 1895.

"Orange and black Skipper" (*R. C.*).

92. HETEROPTERUS DECIPIENS, sp. n. (Plate VI. fig. 7.)

Much resembles the preceding species on the upper surface; the base of the wings streaked with orange-yellow irrorations; the band bright golden orange; the terminal spot connected with it, not separate as in *H. formosus*; the secondaries show a transverse bar at the end of the cell, a longitudinal dash below the latter and six or seven submarginal spots, the first, third, and fourth largest, all orange and squamose: the body above is like that of *H. formosus*, but below it is deep brown as above, the palpi and centre of pectus with golden-orange hairs; the wings below are dark brown, the primaries alone showing a golden-orange band, formed as above, but not so deep in colour. Expanse of wings 30 millim.

Kondowi, Lower Nyika, April 6th, 1895.

"Orange-barred black Skipper" (*R. C.*).

93. CYCLOPIDES MIDAS.

Cyclopides midas, Butler, P. Z. S. 1893, p. 671; 1895, pl. xv. fig. 6.

♂, Kondowi, 4110 feet alt., Lower Nyika, April 11th, 1895.

"Orange-spotted dark brown Skipper" (*R. C.*).

94. CYCLOPIDES QUADRISIGNATUS.

Cyclopides quadrisignatus, Butler, P. Z. S. 1893, p. 670, pl. lx. fig. 9.

♂, Nyankowa Mt., 5425 feet alt., Nyika, April 10th; Kondowi, 4110 feet, April 11th; ♀, Kantorongondo Mt., 5925 feet, April 15th; ♂, Cheni-Cheni Mt., 5500 feet, Nyika, April 17th, 1895.

"Orange-spotted black Skipper" (*R. C.*).

In the specimens now sent, which are in good condition, the spots are bright ochreous and rather more numerous (especially on the secondaries) than in the type: indeed they more nearly approach typical *C. metis*; the wings are, however, decidedly blacker than in that species and there are never more than seven distinct small spots on the secondaries. This would appear to be the representative of *C. metis* in Central Africa.

95. KEDESTES CAPENAS.

Cyclopides capenas, Hewitson, Descr. Hesp. p. 43 (1868).

♀, Lumpi R. valley, 3500 feet alt., Lower Nyika, April 21st, 1895.

"Orange and black speckled underwing Skipper" (*R. C.*).

This rare species was previously only represented in the general collection by one male specimen.

96. PADRAONA ZENO.

♀. *Pamphila zeno*, Trimen, Trans. Ent. Soc. London, 3rd ser. vol. ii. p. 179 (1864); ♂ ♀. South Afr. Butt. vol. iii. p. 313, ♀ pl. xii. fig. 2 (1889).

Var. ♂ ♀. *Padraona watsoni*, Butler, P. Z. S. 1893, p. 671.

Kondowi, 4110 feet alt., Lower Nyika, April 6th and 11th; Kantorongondo Mt., Nyika, 6975 feet alt., April 16th, 1895.

"Orange and brown spotted Skipper" (*R. C.*).

The specimens now received link *P. watsoni* to *P. zeno*, the orange cell-spot of the primaries, which in *P. watsoni* extends almost to the base, proving it to be variable; the discal band of the secondaries also varies in width, and the under-surface colouring from the bright yellow with badly defined darker bands of *P. watsoni* to the duller brown banded character of *P. zeno*: all the examples now received having been taken in April, the differences cannot be seasonal.

97. GEGENES LETTERSTEDTI.

Hesperia letterstedti, Wallengren, Kongl. Svensk. Vet.-Akad. Handl. 1857, p. 49.

♂ ♂, Nyankowa Mt., 5575 feet alt., Nyika, April 9th, 1895.

"Smoky green Skipper" (*R. C.*).

98. BAORIS FATUELLUS.

Pamphila fatuellus, Hopffer, Monatsber. k. Akad. Wiss. Berlin, 1855, p. 643; Peters' Reise n. Mossamb. v. p. 417, pl. 27. figs. 3, 4 (1862).

Ngerenge Plains, W. coast of Lake Nyasa, Feb. 24th; Cheni-Cheni Mt., Nyika, 6430 feet alt., April 17th, 1895.

"Greenish Skipper" (*R. C.*).

99. BAORIS INCONSPICUA.

Hesperia inconspicua, Bertoloni, Mem. Acc. Bol. 1849, p. 15.

Kambwiyi, Lower Nyika, Jan. 21st; Lower Nyika, Feb. 2nd, 1895.

"Green Skipper (decided yellowish-green)." "Dark green speckled-with-white Skipper" (*R. C.*).

100. BAORIS, sp. (A continental form of *B. umbrata*.)

This species, which is almost certain to have been named by either M. Mabille or Herr Plötz, differs from *B. umbrata* of the Island of Johanna only in its slightly superior size, more elongated wings, and blacker colouring; in markings, pale fringes and palpi, and the pale areas below it agrees, excepting that the pale colouring is less pronounced.

Kondowi, Lower Nyika, April 4th, 1895.

101. HALPE NIGERRIMA.

Halpe nigerrima, Butler, P. Z. S. 1893, p. 672.

Kambwiyi, Lower Nyika, Jan. 2nd, 1895.

"Dark green Skipper (speckled with white)" (*R. C.*).

102. HALPE AMADHU.

Pamphila amadhu, Mabille, Comptes Rendus Soc. Ent. Belge, p. lxviii (1891).

Kambwiyi, Lower Nyika, Jan. 21st, 1895.

"Greenish Skipper" (*R. C.*).

These species of *Halpe* never seem to come to hand in numbers, one or two examples in a large collection are all that we ever receive.

103. PERICHARES ALBICORNIS, sp. n. (Plate VI. fig. 8.)

♂. Primaries sericeous olive-brown, sometimes suffused with purplish, the basi-costal area more or less suffused with cupreous; interno-basal area clothed with olive-green hairs, fringe whity brown; two yellowish-white superposed spots within the end of the cell, sometimes connate; a small more or less triangular spot at the base of the second median interspace, a transversely oblong spot below the latter and crossing the first median interspace; two or three small and yellower hyaline spots, separated by the subcostal branches, towards apex, and an opaque bright yellow oblong or oval spot just above the middle of the submedian vein: secondaries deep sericeous olive-brown, central area occupied by a slightly paler patch having a somewhat reddish tinge; base clothed with green hairs, abdominal area with greenish and bronze hairs; fringe whity brown: upper surface and front of palpi, head above, and patagia chocolate-brown; antennæ pure white, emitted from a whitish tuft on the vertex of the head. Primaries below with the costal border and a subapical patch golden copper-brown, the central area greyish black, the internal area paler with a large central diffused whitish spot; hyaline spots necessarily as above; external border from apex to first median branch rosy greyish brown: secondaries golden copper-brown, slightly darker on the costa and in a small subapical patch bounded by two black dots; three ill-defined brown spots in a triangular position across the basal area, a black dot on the upper discocellular and a small black spot beyond; a dust-grey interno-median stripe commencing in a point at base and gradually expanding to outer margin; an irregular purplish-grey streak edged with blackish crossing the disc from the interno-median streak and tapering to apex; outer border paler than the remainder of the wing, bounded internally by an ill-defined brownish line and enclosing two or three triangular grey marginal dots: palpi below dull straw-yellow; antennæ white, with a grey patch on the club; neck and edges of eyes white; pectus densely covered with dull tawny hair, venter rufous brown. Expanse of wings 40 millim.

♂ ♂, Kondowi, Lower Nyika, 4110 feet alt., April 4th to 6th, 1895.

"White antennæ Skipper" (*R. C.*). One specimen collected by Mr. William Murray of the Livingstone Mission.

This is the species of which we received a damaged example from Fwambo (see P. Z. S. 1895, p. 266. n. 63). M. Mabille says that his specimen is a male; and, although this may be an error, the number and character of the spots in the present species differ considerably and are evidently tolerably constant: the sexes rarely show so marked a difference in this group.

104. PERICHARES TELISIGNATA, sp. n. (Plate VI. fig. 9.)

♂. Purplish black; primaries with markings nearly as in the preceding species, but the discoidal spots united into one and only separated from the two median spots by the veins; they thus form a single hyaline patch as in *Coladenia dan*; the subapical spots also form a short transverse trifid bar, and the yellow spot near inner margin is slightly paler; the secondaries are small, without markings, with greenish hairs at base and white fringe; body blackish brown in front, but the thorax and abdomen densely covered with grey-greenish hair; antennæ pure white, with black terminal hook. Primaries below dull black; the costal border, which expands into a broad subapical patch, fiery copper-brown, internal area grey, with a large central diffused dull white patch; external border to below second median branch rosy brown; hyaline spots as above: secondaries fiery copper-brown, purplish black on internal area; an indistinct blackish discal bar, parallel to outer margin; wing crossed by a clear sharply defined white ⅄-shaped character; fringe white: palpi chalky white, as also the front of the tibiæ and tarsi of first pair of legs; pectus blackish, venter densely clothed with grey hairs, anal tufts whitish. Expanse of wings 32 millim.

Kantorongondo Mt., Nyika, 5900 feet, April 15th, 1895.

This is so distinctly marked a species that, if properly described, I could hardly have failed to identify it.

105. RHOPALOCAMPTA FORESTAN.

Papilio forestan, Cramer, Pap. Exot. iv. pl. cccxci. E, F (1782).

Henga, Feb. 1st, 1895.

"Great black, white, and orange Skipper" (*R. C.*).

HETEROCERA.

Only thirteen Moths were in the collection, one or two of which had unfortunately been attacked by the larvæ of a Micro-Lepidopteron, which were discovered still at work after the specimens had been mounted: all the species nevertheless are sufficiently well-preserved for determination.

106. MACROGLOSSA TROCHILUS, var. TROCHILOIDES.

Macroglossa trochiloides, Butler, P. Z. S. 1875, p. 5.

Nyankowa Mt., Nyika, 6500 feet alt., April 9th, 1895.

"Green and orange Humming-bird Hawk" (*R. C.*).

This form of *M. trochilus* appears to cross the African continent from west to east; it differs from the southern type principally in the blacker and therefore better-defined outer border to its secondaries. There can, however, be no doubt, from the fact that an example of the southern type was obtained by Mr. Scott Elliot, that the ranges of the two forms overlap in South-eastern Africa: *M. trochiloides* therefore will probably prove to be a dimorphic form of *M. trochilus* which becomes permanent on the N.W. coast.

107. MELITTIA ÆNESCENS, sp. n. (Plate VI. fig. 10.)

Allied to *M. natalensis*; primaries slightly narrower, purplish indigo, with the same transparent spot between the second and third median branches; secondaries hyaline with black veins, narrow black margins, and dust-grey fringe paler at the edge; head olive-brown; antennæ purplish black above, shining straw-yellow below, and deep ferruginous in front; collar and thorax golden brassy, with green reflections; abdomen purplish indigo, with dorsal golden brassy transverse bands on the front of each segment: primaries below becoming brownish grey from beyond the cell; otherwise the wings are as above: palpi and face white stained with yellow; pectus slaty black, the sides in front and the front legs golden brassy, tibial and tarsal joints reddish; middle legs golden to the end of the tibia, tarsus purplish black; posterior legs blackish brown, the tibial joints densely clothed with long black, red, and white hairs; tarsi black externally, white internally. Expanse of wings 37 millim.

Karonga, W. coast of Lake Nyasa, Feb. 28th, 1895.

"Black-plumed Humming-bird. Taken in tent fluttering round candle-lantern by night" (*R. C.*).

When in fresh condition this must be an exceedingly beautiful insect.

108. XANTHOSPILOPTERYX SUPERBA.

Eusemia superba, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xv. p. 141, pl. 13. fig. 3 (1875).

♂, Ngerenge Plain, W. coast of Lake Nyasa, Feb. 24th, 1895.

"Crimson-underwing Tiger" (*R. C.*).

The smallest example of this beautiful Agaristid that I have seen.

109. ÆGOCERA MENETA.

Noctua meneta, Cramer, Pap. Exot. i. pl. lxx. D (1775).

There is no label to this example.

110. SYNTOMIS CERES.

Syntomis ceres, Oberthür, Études, iii. p. 33, pl. 3. fig. 5 (1878).

Kambwiyi R., Lower Nyika, Jan. 21st and Feb. 2nd, 1895.

"Scarlet and blue-bodied Forester" (*R. C.*).

111. METARCTIA RUBRA.

Anace rubra, Walker, Lep. Het. vii. p. 1720 (1856).

♂, Kaparo, Songwi R. plains, W. coast of Lake Nyasa, Feb. 26th, 1895.

"Orange and grey striped Ermine" (*R. C.*).

112. ARGINA AMANDA, var. OCELLINA.

Deiopeia ocellina, Walker, Cat. Lep. Het. ii. p. 571 (1854).

♀, Kwereru Hill, Deep Bay, April 22nd, 1895.

"Orange and black spotted. Full of lemon-coloured ova" (*R. C.*).

113. DEIOPEIA PULCHELLA.

Tinea pulchella, Linnæus, Syst. Nat. i. p. 534 (1758).

Deep Bay, March 5th, 1895.

"Pink, black, and white speckled. A day-flier apparently: taken on flowers in hot sunshine" (*R. C.*).

I am surprised that Mr. Crawshay did not recognize this as a rare British moth, usually known as the "Crimson-speckled Footman."

114. LOPERA CROCATA, var.?

Liparis crocata, Herrich-Schäffer, Ausl. Schmett. pl. 24. fig. 112 (1854).

♂, Kondowi, Lower Nyika, April 6th, 1895.

"Raw silk-coloured Ermine" (*R. C.*).

The single example obtained appears to have been at some time very wet, so that it is impossible to decide whether or not there have been any of the scarcely deeper bands across the primaries which a lens shows plainly on the front wings of *L. crocata*; the orange spot at the end of the cell is more regularly circular than in most examples and is not dotted with black. Until better specimens are received, it is not safe to assume that we have to do with a species distinct from *L. crocata*.

115. A LIMACODID MOTH.

The single specimen obtained was a female, not quite perfect: the neuration is slightly unusual, veins 7 and 8 of the front wings being emitted, from a footstalk, from 9. The sexes of some of the Limacodidæ differ so much from the males, that it is hardly safe to name an unpaired female, as it may subsequently prove to be merely the other sex of some well-known male insect.

♀, Lower Nyika, Feb. 2nd, 1895.

"Eggar moth" (*R. C.*).

116. DRASTERIA JUDICANS.

Ophiusa judicans, Walker, Lep. Het. xv. p. 1831 (1858).

Kondowi, Lower Nyika, April 4th, 1895.

"Dusky grey moth" (*R. C.*).

117. HETERABRAXAS ROSEOVITTATA.

♀. *Heterabraxas roseovittata*, Butler, P. Z. S. 1895, pl. xliii. figs. 2, 3.

♂. The antennæ have long radiating branches; the black markings on the primaries are better defined than in the female; the secondaries are straw-yellow, with a few scattered black spots, differing entirely on the opposite wings. Expanse 41 millim.

Not labelled: body eaten out by caterpillar of Tineid.

This is the example referred to in my previous paper and figured.

EXPLANATION OF PLATE VI.

Fig. 1. *Hyreus virgo*, p. 121.
2. *Neptis incongrua*, p. 112.
3. *Mylothris narcissus*, var. *dentatus*, p. 124.
4. „ *crawshayi*, p. 124.
5, 6. *Teracolus infumatus*, p. 128.
7. *Heteropterus decipiens*, p. 130.
8. *Perichares albicornis*, p. 132.
9. „ *telisignata*, p. 133.
10. *Melittia ænescens*, p. 134.

3. On the Intestinal Tract of Birds.

By P. CHALMERS MITCHELL, M.A., F.Z.S.

[Received December 13, 1895.]

The material upon which this paper is based consists almost entirely of birds which have died in the Society's Gardens. The work has been done in the Prosector's laboratory. I have therefore to express my great indebtedness to the Society and to its Prosector, Mr. F. E. Beddard, F.R.S.

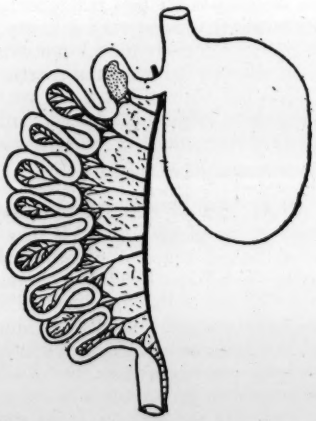
By his prolonged and beautiful investigations into the structure and disposition of the alimentary canal in birds, Dr. Gadow[1] has not only proved the taxonomic value of the intestinal convolutions in birds, but has described the details of structure in a very large number of cases. Dr. Gadow paid particular attention to the number of loops and to their disposition in the abdominal cavity. His descriptions and figures refer chiefly to the intestines as they are seen from the right side of the bird's body when the right abdominal wall has been removed. The descriptions and figures now to follow are based on the method described in my paper

[1] "Versuch einer vergleichenden Anatomie des Verdauungssystemes der Vögel," Jena Zeitschrift, xiii. pp. 92–171; pp. 339–403.—"On the Taxonomic Value of the Intestinal Convolutions in Birds," P. Z. S. 1889.—Bronn's 'Thierreich,' Vögel, pp. 591–793.

upon *Chauna*[1]. I am thus able to display more clearly the relations of the individual cases to each other and to what I take to be the primitive type, and to show the mesentery and the intestinal veins. The intestinal tract was removed from the body-cavity after section of the œsophagus and of the rectum above the cloaca. The stomach was placed to the right with its ventral side uppermost, and the loops of the intestine were folded outward. The condition of the material made it impossible to inject the vessels in enough cases to serve for comparison; but copious washing and the passage of a jet of water through the canal oxygenated the clotted blood in the veins and made it possible to trace their course. Where I was able to trace them, I found that the arteries followed the veins closely; but it is only the veins that I describe here.

In the simplest possible condition the intestine would run a straight course from the stomach to the cloaca, suspended to the dorsal wall of the body-cavity by a fold of mesentery. The intestine grows longer than the length of the body-cavity, and, in consequence, is thrown into a series of folds. The first of these, usually a single distinct loop, contains the pancreas; then follows a more irregularly folded portion, the mesentery of which is an arc of a circle, with its diameter attached to the dorsal body-wall, and the median point of its circumference stretching toward the ventral body-wall in the region where the yolk-sac was attached. The rectum is a portion of the gut which usually retains the primitive straight condition. In fig. 1, which I drew from a dis-

Fig. 1.



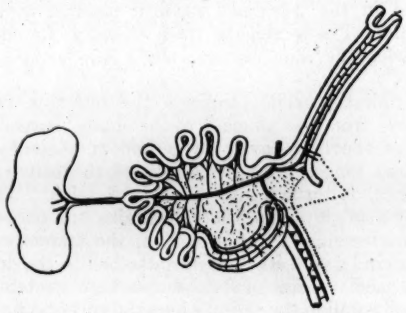
Alligator mississipiensis; intestinal tract, showing a simple condition.

[1] "On the Anatomy of *Chauna chavaria*," P. Z. S. 1895, pp. 350–358.

section I made of an Alligator, is shown such a simple mode of increase in length.

In fig. 2, which is drawn from the embryo of an Argus Pheasant about thirty days old, a primitive type of the avian intestine is shown, and it is easy to compare with this the simpler Alligator type and the more specialized arrangement in other birds. The avian intestine consists of three divisions, each typically supplied with a tributary of the portal vein. The first loop or duodenum

Fig. 2.



Argus giganteus; intestinal tract, from a chick after incubation for thirty days.

is considerably elongated, and may be folded or even spirally twisted at the free end. It contains the greater part of the pancreas, although in some cases the pancreas encroaches upon other parts of the intestine. Its mesentery is simply the elongated anterior portion of the common dorsal mesentery seen in the Alligator, and it contains the anterior mesenteric vein. The duodenum, as Dr. Gadow has shown, lies most ventrally of all the folds of the intestine, it being folded backward and downward upon the other loops. As a result of this position it frequently happens that branches of the anterior mesenteric vein leave the mesentery, and, bridging the intervening space, supply part of the posterior region of the gut. I have found these bridging-vessels remarkably constant in the groups in which they occur, and they seem to present a striking instance of a feature which, apparently, could only have arisen from the "accident" of contiguous position, and is fixed as a normal part of the structure. For where the part of the gut obtains its veins from this extrinsic source, the normal vein, a branch of the middle mesenteric vein which runs backward, is present. The bridging-vessels from the duodenum are short circuitings which have been perpetuated.

The duodenum, usually a simple loop, is in some instances expanded into a branching system of folds. This occurs in birds belonging to widely different groups, and must be taken as a convergent resemblance.

After it leaves the duodenum, the dorsal mesentery expands into a great, almost circular, fold, with the middle mesenteric vein running out to the yolk-sac in the centre of the fold. The gut is suspended at the circumference of this circular fold, and, in the simple type, is thrown into a number of corrugated folds around the circumference, which closely resemble the corrugated folds in the Alligator. At the posterior part of this circumferential part of the gut is the point where the cæca are attached, and the cæca run forward along the sides of the posterior part of this loop. In a simple case such as in this young bird the edge of the mesentery corresponding to its line of attachment, and represented by a dotted line in the figure, passes directly into the edge of the mesentery of the rectum. But in most fully grown birds the part of the gut with the attached cæca has been rotated under the rectum, that is to say over it as seen in the diagram, until the point of attachment of the cæca is brought close up to the starting-point of the duodenum. Consequently, when the gut is lying on the table with its primitive ventral side uppermost, the rectum and the rectal vessel are covered along the greater part of their length by the circular part of the gut. Finally, individual folds, from among the numerous small corrugated folds of the circular loop of gut, increase enormously in length, and Dr. Gadow has shown that the number of the loops that grow out, and the mode in which they lie, folded over or under each other within the body, are characteristic of avian groups. Where the folded loops come in contact with each other, minor short circuitings take place in the veins, and it occasionally happens, notably with Parrots, that secondary sheets of connective tissue, usually containing masses of fat, bind loops belonging to different parts of the circular fold very closely together. But even in these cases, and without difficulty in most birds, these loops may be dissected from each other, and the primitive circular loop of mesentery becomes apparent and is seen to contain the median branch of the mesenteric vein. The series of figures in this communication exhibit the gut when this unfolding dissection has been performed.

The rectum, or last part of the gut, in the vast majority of cases retains its primitive straight position, and is closely attached to the dorsal wall of the body-cavity by the posterior part of the primitive straight mesentery. The rectal vessel or posterior mesenteric vessel runs in this. It leaves the common stem of the portal vein very close to the anterior mesentery or duodenal vessel, and runs backward to the cloaca. Just in front of the cloaca a large median vessel leaves this and runs upward to the surface of the kidneys. There it forks, and each fork, after receiving several veins from the parietes, runs forward along the under surface of the kidney.

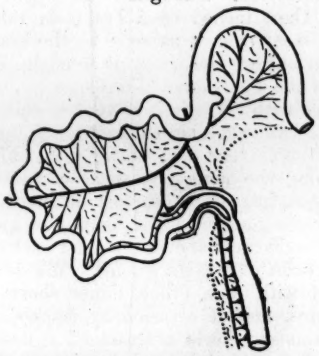
I shall now proceed to describe the deviations from this ground-type so far as I have had the opportunity of following them in the main groups of birds. The kaleidoscopic variety, in which the same

end—extension of gut—has been attained in different groups, would seem to offer a field of enquiry that may ultimately give important results bearing on the problem of divergent evolution. Dr. Gadow has shown that the modes of coiling the gut have systematic value: so far as my material has been able to take me, it looks as if the divergencies were grouped indifferently around the common type.

Ratitæ.

In the Cassowary (fig. 3) the common type is retained with an almost diagrammatic simplicity. The duodenum is a short, very

Fig. 3.



Casuarius; intestinal tract.

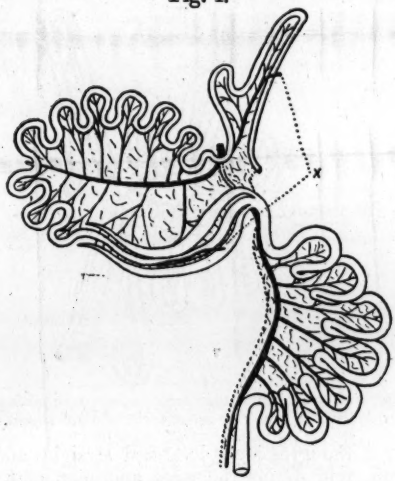
wide loop, and presents the peculiarity, which may have been an individual abnormality in my specimen, that the hepatic and pancreatic ducts open on a wide diverticulum of the distal limb of the loop. The circular fold of mesentery has the very slightly folded gut suspended at its circumference, and the remains of the yolk-sac appear as a short cæcum in the middle of the loop. The rectum is short and straight, and the cæca are in the typical position. The blood-vessels are absolutely typical.

The Emu which I examined (*Dromœus novæ-hollandiæ*) was identical in its main features with the Cassowary, and it is unnecessary to give a separate drawing. The duodenum was narrower and longer, and the hepatic and pancreatic ducts opened separately into the duodenum, not upon a common diverticulum.

The Ostrich (fig. 4), which was the fine male known as the Queen's Ostrich, presented an important deviation. The first two parts of the intestine and the three great veins were according to type, the yolk-sac diverticulum being conspicuous on the circular loop opposite the end of the median mesenteric vein. The distal limb of the duodenum presented a short lateral diverticulum, and the cæca are relatively longer than in *Casuarius* and, as has been

described frequently, were marked by the attachment of a spiral valve. But the rectal part of the intestine, that supplied by the

Fig. 4.



Struthio camelus; intestinal tract. *x*, short-circuiting vessel cut across.

posterior mesenteric vein, is expanded into an enormous coil swung at the circumference of a semicircular expansion of its mesentery. Only in *Chauna* and in the Eagles and Petrels have I found the slightest trace of a convergent resemblance to this feature, but in the latter the subsidiary rectal loops, although supplied by the rectal vessel, lie above the cæca.

I have not yet had an opportunity of dissecting a Rhea or an Apteryx [1].

It is plain that, so far as degree of divergence of type in the alimentary canal goes, the Ratites deserve their accepted place at the bottom of the avian scale.

Carinatæ.

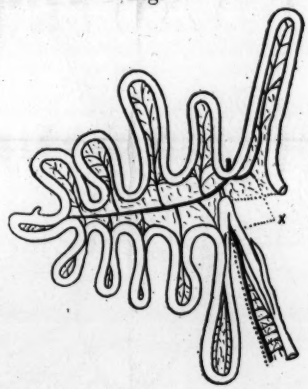
Colymbiformes.

In these (*Podiceps* not examined) (fig. 5, p. 142) the duodenal loop is straight and normal. The circular loop is pulled out into a series of minor loops that are arranged almost symmetrically round the middle mesenteric vein. The yolk-sac vestige lies in front of the middle point of the series. The last loop of the circular system

[1] [In a *Rhea americana* which I have more recently examined the gut was intermediate in form between those of *Casuarius* and *Struthio*. The anterior portion resembled *Casuarius*; the rectum had an expansion recalling that in the Ostrich, but much less strongly marked.—P. C. M., *March* 1896.]

is longer than the others, as frequently happens when the cæca are relatively short. It is drained partly by the duodenal vein.

Fig. 5.



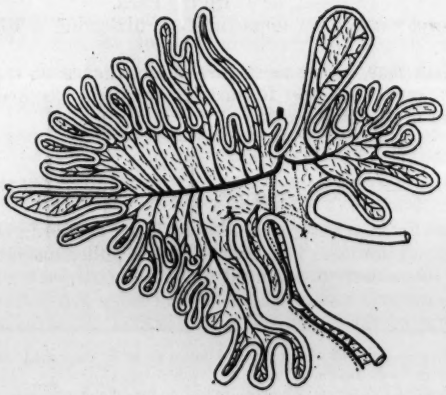
Colymbus septentrionalis; intestinal tract. *x*, short-circuiting vessel from duodenal to posterior mesenteric vein cut across.

The last part of the intestine is long and straight, and the posterior mesenteric vein drains the cæca and part of the region in front of the cæca.

SPHENISCIFORMES.

In these (fig. 6) the primitive arrangement is disguised by the enormous length of the gut and consequent complexity of the

Fig. 6.



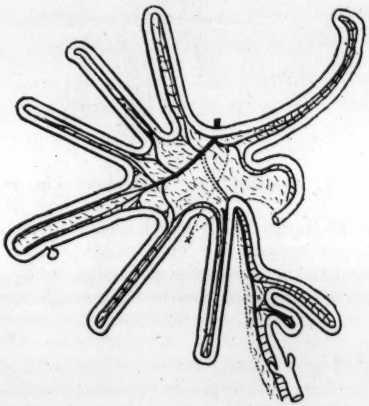
Eudyptes chrysocome; intestinal tract. *x*, short-circuiting vessel cut across.

three parts. In *Eudyptes chrysocome* the duodenum forms a subsidiary system of loops; in *Aptenodytes pennanti* a spiral, bearing a convergent resemblance to the duodenum of the long-gutted Sea-Eagles. The circular loop is thrown into an enormous series of minor folds, about the middle of which, but in a position similar to that in the Divers, occurs the yolk-duct vestige. The last two loops are supplied from the duodenal vessel. The posterior part of the gut is quite like that of the Diver, although the cæca are still further reduced.

Procellariiformes.

The Northern Petrel (fig. 7) presents several interesting modifications of the type. The duodenum is compound, the first part being twisted round the small gizzard, the second part forming a

Fig. 7.



Fulmarus glacialis; intestinal tract. *x*, short-circuiting vessel cut across.

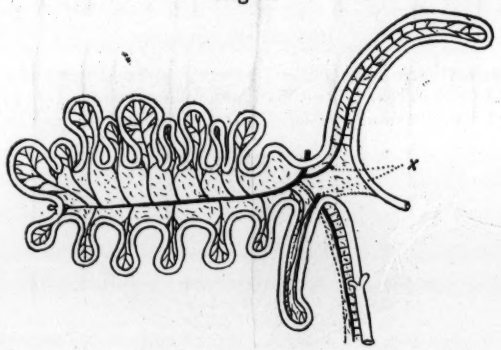
long loop containing the pancreas in the typical fashion. The circular loop is drawn out into a number of straight narrow loops, on the fourth of which occurs the vestige of the yolk-duct. The last loop is drained partly from the normal source and partly by a short-circuiting vein from the duodenum. The posterior part of the intestine is like that of *Colymbus* and the Penguin, with the exception that, as in the Sea-Eagle, the portion of the gut supplied by the posterior mesenteric vessel, but anterior to the origin of the cæca, is expanded into two subsidiary loops.

Ciconiiformes.

The birds in this group that I have examined have all departed similarly from the type. The whole intestine is enormously elon-

gated, the greater part of the elongation having occurred in the circular loop. The cæca are small, and lie on the third part of the gut, some distance below where it joins the circular loop. As usually happens when the cæca are reduced, the last part of the circular loop is pulled out into a long free loop, which, in the natural position, is closely attached to the under surface of the duodenum, and gives a vein to the duodenal vein. *Platalea leuco-*

Fig. 8.



Platalea leucorodia; intestinal tract. *x*, short-circuiting vessel cut across.

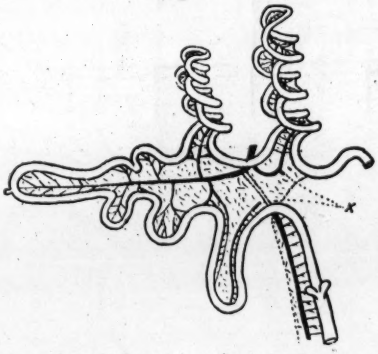
rodia, the Spoonbill (fig. 8), shows the least differentiation among those that I have examined. The duodenum is very long and is curved far round to the left in the abdominal cavity. The circular loop is enormously expanded, and forms a rough spiral, of which the middle mesenteric vein, running out to the vestige of the yolk-duct, forms the axis. The figure represents this after it has been dissected out and is more diagrammatic than most of the drawings I give. The most important points to which I would call attention are: that the yolk vestige, though at the end of the spiral, is much nearer the posterior than the anterior end of the circular loop, owing to the greater development of the first half of the circular loop; and the fact that on the whole the minor loops of the circular loop are of similar length, with the exception of the last loop. It is in this respect especially that the Spoonbill has departed less than other Ciconiiformes from the type. The veins of the gut are almost diagrammatic in the simplicity of their arrangement, the only peculiarity being the short-circuiting branch from the duodenal vein to the distal loop of the circular loop.

In *Pseudotantalus ibis* the duodenum, which was curved in *Platalea*, is very much elongated and twisted into a spiral. The first portion of the circular loop is elongated into a separate loop: the remainder of the circular loop is more primitive even than in *Platalea*, consisting of a number of nearly equal radial folds at the circumference of the whole fold. There is a very

slight spiral twist, the axis of which is the middle mesenteric vein, which runs out to the yolk-duct vestige. The last loop and the third part of the intestine, and the veins, are as in the Spoonbill.

Ciconia alba, *Ciconia nigra* (fig. 9), *Leptoptilus crumeniferus*, and *Leptoptilus argila* show the tendency to form spirals which is present throughout this group in an increasing degree. In these four birds the duodenum forms a spiral which, in *C. nigra*, is

Fig. 9.



Ciconia nigra; intestinal tract. *x*, short-circuiting vessel divided.

twisted with a spiral formed from the first subsidiary loop of the circular loop. The remainder of the circular loop is elongated in them all, and the yolk-duct vestige occurs at the elongated point. The last loop of the circular system and the third part of the gut and the veins occur in the fashion typical of the whole group.

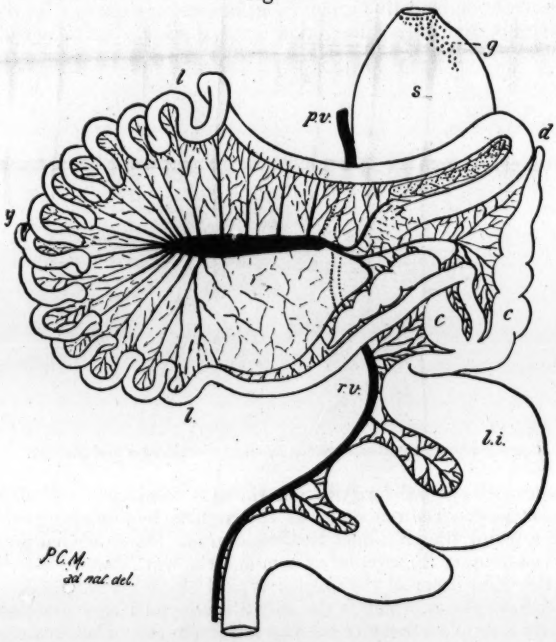
Pelecanus fuscus, which is the only Steganopod I have examined, displays a simple variety of the Ciconiiform type. The duodenum is straight and encloses a curiously lobulated pancreas. The circular coil begins with a short straight minor loop, and then forms an enormous bunch of short equally sized loops, supplied by radiating branches of the middle mesenteric vein. Upon one of these, nearer the posterior than the anterior end, occurs the yolk-duct vestige. The end of the circular loop is drawn out into the usual loop, with a short-circuit vein from the duodenum, and the third part of the gut is as in the other Ciconiiformes.

Anseriformes.

The striking character of the Anseriformes is the small deviation from the primitive type represented in their intestines. As I have already pointed out in a communication on the anatomy of *Chauna*, the gut of that bird has deviated from the avian type even less than the gut of the Ostrich. The result is a very striking similarity between the gut of the Struthious birds, of *Chauna*, and of an

immature Gallinaceous bird. I reproduce here a cut from my paper on *Chauna* (fig. 10). The duodenum is a distinct fold, and the duodenal vein receives short-circuiting branches from the

Fig. 10.



Intestine of *Chauna chavaria*.

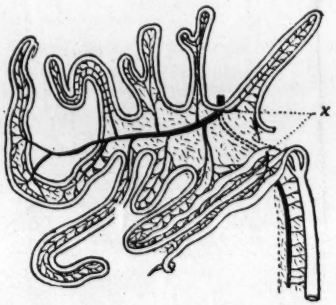
s. Proventriculus with *g* the glandular patch.
d. Duodenum enclosing the pancreas (the duodenum has been turned forward).
l to *l*. The large loop of the intestine, with *y* the yolk-sac diverticulum about the middle of its length. This coil has also been raised up and turned forward. The remains of the ventral mesentery running from the diverticulum are not shown, as they lie under the intestinal loop.
c c. The cæca. *l.i*. Large intestine.
r.v. Rectal mesenteric vein. This dips under the mesentery of the large loop, where its course is shown by a dotted line. It there joins with the large central vein of the large loop and with the veins from the duodenum and cæca, and the blood passes forward, its course being shown by a dotted line, to the portal vein *p.v*.

hinder region of the circular fold, especially from one of the cæca, which, in the diagram, is represented as turned outwards. The circular loop differs in no essential respect from the primitive avian type, as displayed in the Ostrich and young Argus. The

resemblance to the Ostrich is heightened by the fact that in *Chauna* and the Ostrich the rectum, by being thrown into a subsidiary set of folds, departs in a similar way from the common type. The resemblance between *Chauna* and *Rhea* is very striking.

The Ducks and Geese (fig. 11) display a very definite and simple modification of the ground-type. It consists simply in the elongation of a limited number, generally five, of the primitive irregular loops of the circular loop. In a young *Bernicla magellanica*, still in its down plumage, the duodenum and the third part of the gut were in the typical condition, but the circular loop was already pulled out into three or four subsidiary loops, of which the longest bore the yolk-duct vestige. In adult Ducks, Geese, and Swans the arrangement differed in no essential respect from the drawing

Fig. 11.



Cygnus atratus; intestinal tract. *x*, short-circuiting vessel divided.

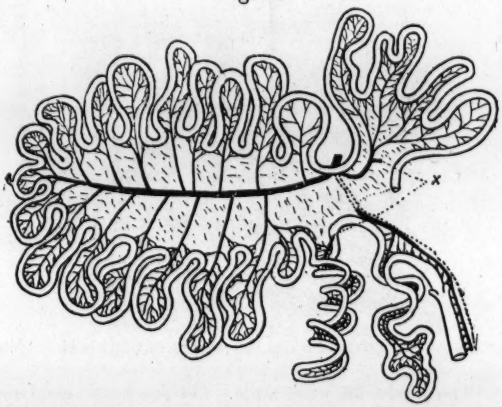
(fig. 11). The duodenum was simple. The duodenal vessel received short-circuiting veins from the hinder portion of the circular loop. A striking feature of the minor loops on the front part of the mid-gut is the presence upon them of minor loops. The circular loop had a huge median mesenteric vein, which ran out to the much elongated subsidiary loop bearing the yolk-duct. It gave off three vessels to three expansions of the proximal part of the circular loop, vessels to a long and short distal expansion, and a vessel to the straight part of the loop along which the cæca were attached. The rectum was straight and in the typical fashion was supplied by a posterior mesenteric vein.

Falconiformes.

I have not had the opportunity of examining any of the Cathartæ. The Accipitres show a marked divergence from the common type. The gut generally is enormously long, especially in the fish-eaters. From the point of view of relation to type, I cannot see that there is any special relation between the Accipitrine deviation and the

deviation among the Pelargi, although Dr. Gadow has laid some stress on the existence of such a resemblance. In some of the Vultures and Falcons there are spirals formed by the subsidiary loops, just as occurs, for instance, in *Ciconia* (fig. 9). On the other hand, members of both groups exhibit a much simpler method of attaining increased length, and this seems to imply that the spiral formation is a convergent resemblance. When the simplest members of the groups are taken—I am speaking of them only from the point of view of gut-formation—the special spiral formation disappears and the relations between the groups are only their relations to the common type. The White-tailed Sea-Eagle (fig. 12) shows the general character of the group. Its gut is very long, and if the spiral twists were a character of the

Fig. 12.



Haliaëtus albicilla; intestinal tract. *x*, short-circuiting vessel divided.

group one would expect the increased length to be displayed in the formation of complicated spirals. This does not occur. The duodenum is thrown into a complicated set of subsidiary loops, thus recalling the similar modification in the Penguin. Among the Accipitrines generally the duodenum is a very wide irregular loop, but I have not found it thrown into secondary loops in other cases. The circular loop forms a very extended set of minor loops, some of which, especially on the lower side, are slightly twisted into spirals. In other Accipitres it is more often the upper loops of this series that are twisted. The vestige of the yolk-duct occurs at the end of the median mesenteric vein in the typical fashion, but is situated rather nearer the proximal end of the loop. The last loop of the circular system is very long and usually, as in *Haliaëtus*, spirally twisted. It gives a short-circuiting vein to the duodenal vein. The part of the hind gut between the cæca and the circular loop is thrown into a complicated set of folds,

supplied by the posterior mesenteric vein. This structure is present in all the Accipitres I have examined, and Dr. Gadow states that all the Accipitres and Cathartæ have irregular kinks above the rectum. A similar deviation occurs in the Petrels (fig. 7, p. 143).

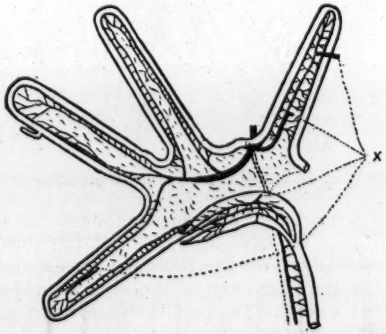
Galliformes.

I have not had the opportunity of dissecting any Galliformes except Galli. The figure of the young Argus Pheasant (fig. 2) may serve as a type for the adult intestine of the Peacocks, Fowls, Quails, Tragopans, and so forth. The three great portions of the intestine and the three great mesenteric veins are always present in the typical form. The adult shows the vestige of the yolk-duct at the end of the middle mesenteric vein. Branches radiate off from the middle vein to the irregular loops of the circular fold, and the last part of the circular fold, along which the enormous cæca lie, is drained partly by a recurrent branch of the middle mesenteric vein and partly by short-circuiting branches from the vein of the duodenum. The rectum is always straight.

Gruiformes.

Like the Galliformes, the Gruiformes closely conform to the primitive type. The gut is short, and instead of being thrown into a number of irregular minor loops the subsidiary loops are

Fig. 13.



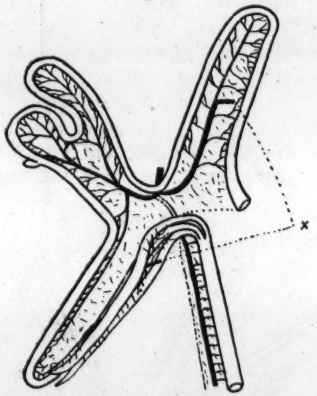
Crex pratensis; intestinal tract. *x*, short-circuiting vessel divided.

few in number and definitely placed. The Common Land-Rail (fig. 13) may be taken as typical of the Rallidæ. *Porphryio* and *Aramides* are practically identical with it, and the Cranes and *Psophia* differ only in minor particulars. The duodenum is a narrow regular loop: the circular loop is pulled out into four narrow subsidiary loops; upon the distal limb of the second subsidiary loop the vestige of the yolk-duct is found. This is very large and is bound

down by the remnant of a primitive ventral mesentery. The last minor loop of the circular portion of the gut has the long cæca running forward alongside it. It is drained in the usual fashion by a branch of the mid-mesenteric vein and by short circuit branches from the duodenal vein. At first sight there is a striking similarity between the gut of the Rails and the gut of *Fulmarus* (fig. 7, p. 143); but this is due simply to the narrowness and regularity of the loops. The position of the yolk-duct vestige differs in the two, while the short cæca and the kinks immediately above them make absolutely distinctive characters in the Petrel.

In the Dicholophidæ and the Otididæ the Ralline characters are still obvious, but the gut is still shorter and the loops more definite. *Cariama cristata* (fig. 14) shows the duodenum and the rectum identical with the Rails; the last portion of the circular loop is

Fig. 14.



Cariama cristata; intestinal tract. *x*, short-circuiting vessel divided.

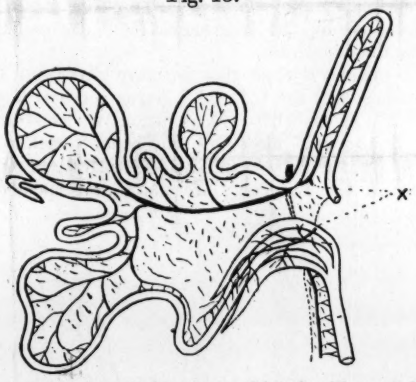
identical in its arrangement and veins, although the cæca are still larger. The rest of the mid-gut is reduced, the third loop being absent. The yolk-duct vestige is in the same place upon the second loop, but the first loop of the circular mid-gut is partly united with the second. In the Otididæ the gut appears to be further modified in the direction in which *Cariama* differs from *Crex*. The duodenum, the rectum, and the last loop of the mid-gut are as in the Rails and *Cariama*; but the remainder of the mid-gut is reduced to a single loop, corresponding to the second of that region in *Crex*, and bearing the yolk-sac vestige on its distal limb.

Charadriiformes.

The birds associated in this Order display a very varied series of divergences from the type. Among those Limicolæ that I have

examined, *Numenius* (fig. 15) certainly is nearest the common type. The duodenum is a simple loop supplied with the usual vein ; the circular loop is nearly symmetrical, and the vestige of the yolk-duct

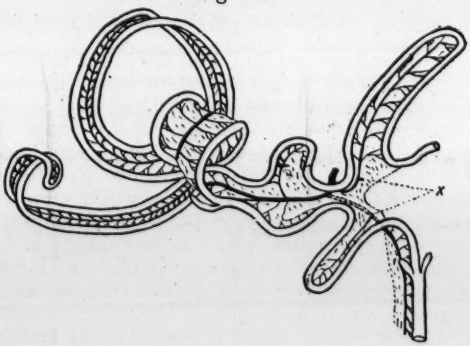
Fig. 15.



Numenius arquata ; intestinal tract. *x*, short-circuiting vessel divided.

occurs about the middle of its length. As in the Rails this is remarkably large even in adult life, and frequently is bent on itself and tied down by remains of the primitive ventral mesentery. The long cæca lie alongside the posterior part of the circular coil, which gives a short-circuiting vein to the duodenal vessel. The rectum is straight. *Glareola* resembles *Numenius*, but is even simpler. In other Limicolæ the general tendency is to an asymmetrical extension of the circular loop and to a reduction of the cæca. The Woodcock (fig. 16) may be taken as an extreme case of this kind of divergence. The general arrangement of the loops

Fig. 16.

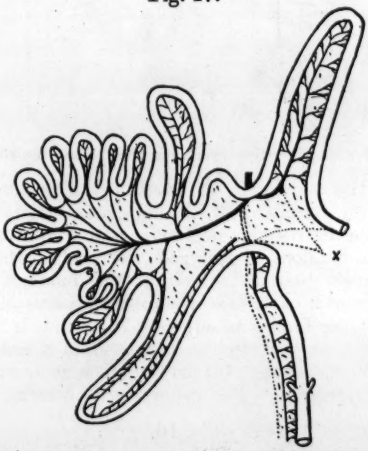


Scolopax rusticola ; intestinal tract. *x*, short-circuiting vessel divided.

and blood-vessels remains as in *Numenius*; but the large subsidiary loop, on the distal limb of which lies the yolk-sac vestige, is pulled out into an enormously long narrow loop, which is then rolled up into a spiral. The distal part of the circular loop is very much reduced, although there still remains a small loop in the position occupied by the long cæca of *Numenius* and giving a vessel to the duodenal vein.

The Gulls display a type that is more divergent than *Numenius*, in that the cæca are reduced. *Larus marinus* (fig. 17) shows that in other respects they are as primitive as *Numenius*. The duodenum is a simple loop with the usual vessel. The circular coil of the mid-gut is thrown into a series of irregular loops, which, however, as in the Limicolæ, are more developed on the side

Fig. 17.



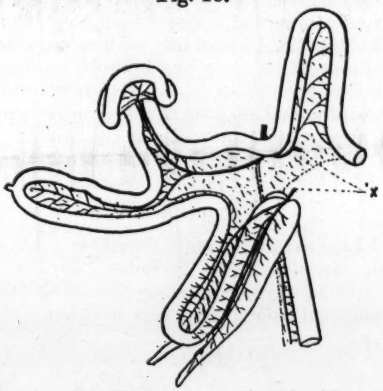
Larus marinus; intestinal tract. *x*, short-circuiting vessel divided.

anterior to the yolk-sac vestige. This lies in the normal position opposite the end of the median mesenteric vein. The last part of the circular loop forms an extended subsidiary loop supplied by a short-circuiting vein from the duodenal vessel. I have not found instances myself, but Dr. Gadow states that in some Gulls spiral folds occur in the region corresponding to the spiral fold of *Scolopax*. Thus the Gulls and the Limicolæ would form a series of divergences from the common type, but in parallel directions.

Pterocles (fig. 18) diverges in yet another direction. The extremely primitive character of the gut is obvious at once. The duodenum, the circular loop, and the rectum are all distinct and have the usual veins. The middle of the mid-gut is marked by the vestige of the yolk-sac placed at the end of the median mesenteric vein. As in Charadriiformes generally, the anterior portion

of the circular loop is expanded. In *Pterocles* it forms a long narrow loop, the end of which is bent upon itself. The posterior

Fig. 18.

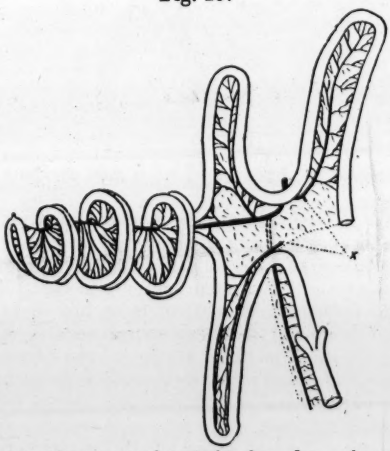


Pterocles bicinctus; intestinal tract. *x*, short-circuiting vessel divided.

part of the circular loop remains in the primitive condition, and has the long cæca attached to it. A short-circuiting vein from the duodenum is present. The rectum is straight.

In the Columbæ which I have examined (*Columbæ* of several species, *Phlogœnas cruenta*) (fig. 19), it is tempting to regard the

Fig. 19.



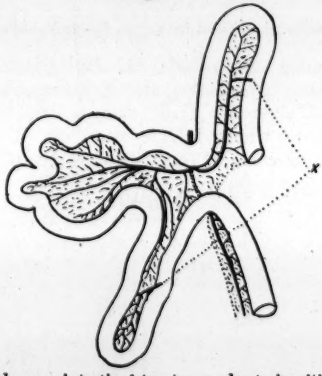
Columba livia; intestinal tract; the spiral is figured as rather too symmetrical. *x*, short-circuiting vessel divided.

gut as a simple derivative of the type seen in *Pterocles*. The duodenum is longer and narrower. The circular loop is enormously expanded, but the three subsidiary loops seen in *Pterocles* remain. The first of these is somewhat shortened; the second, that bearing the yolk-sac vestige at its end, is enormously lengthened; the mesentery is folded along the line of the median mesenteric vessel, so that the two limbs of the loop are brought in contact with each other, and, finally, the whole folded loop is rolled into a rough spiral. The third subsidiary loop of the circular part of the gut has the same arrangement and veins as in *Pterocles*; but the cæca no longer run along it, but occur as very short stumps upon the rectum.

Cuculiformes.

Of these, I have examined only *Corythaix* (*chlorochlamys* and *persa*) and a number of Psittaci. So far as I can see, one has to go back to the common type for both. *Corythaix* (fig. 20) has a remarkably short and wide gut, in correspondence with its frugi-

Fig. 20.



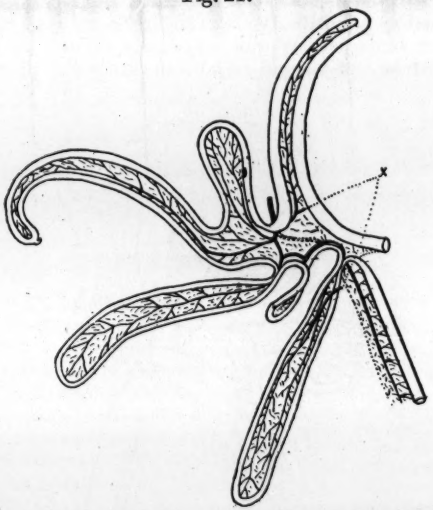
Corythaix chlorochlamys; intestinal tract. *x*, short-circuiting vessel divided.

vorous habits. The duodenal loop is wide and straight. The circular loop is short; its anterior portion forms a normal coil, is slung at the circumference of the circular mesentery, and is supplied by radiating branches of the median mesenteric vein. No doubt the vestige of the yolk-duct occurs upon this; but in my specimens, which were all affected with tubercular nodules on the gut, I failed to identify it. The distal portion of the circular coil, along which the cæca run in the primitive type, is pulled out into a narrow subsidiary loop, the distal portion of which gives a short-circuiting vein to the duodenal vein. The rectum is straight, and there was no trace of cæca. The gut appears to be directly derived from the primitive type by shortening and by loss of the cæca, the distal

loop of the mid-gut with its special vein apparently being a reminiscence of the stage with functional cæca.

In the Parrots, Macaws, and Parrakeets that I have examined the gut presents no great divergences. It is invariably very long and slender, and the subsidiary loops are folded upon each other, and twisted and doubled in a very perplexing manner. Moreover, the masses of twisted gut are overgrown by connective tissue loaded with fat, and short-circuiting connections between the veins are common. The relation to the common type, however, is easily made out. *Ara ararauna* (fig. 21) may serve as an instance; the

Fig. 21.



Ara ararauna; intestinal tract. *x*, short-circuiting vessel divided.

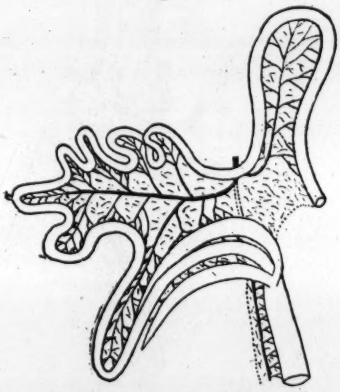
duodenum is considerably wider than the rest of the gut, and is a simple loop, partly curved at the end. The circular loop is enormously expanded and is pulled out into a number of subsidiary loops, four in number, as in *Ara*, but numerous minor subsidiary loops usually occur between them. The first of the four is short in *Ara*; the second, as in the others that I have examined, bears the vestige of the yolk-duct at its extremity; the third and fourth are very long, and the fourth has a short-circuiting vein to the duodenum, and corresponds to the part of the circular loop along which the cæca run in the primitive type. The rectum is straight and bears no trace of cæca. The three main veins—the duodenal, the median, and the posterior mesenteric—occur in the typical fashion. When the minor loops between the four subsidiary loops are abundant, as, for instance, in *Chrysotis*, the gut bears a resemblance

to that of the Accipitres ; but this, I think, is superficial, and merely due to the relation to the common type. The marked features of the divergence from type in the Psittaci consist in the elongation of a definite number of loops and in the matting of these loops together, the loops being folded over each other backward and forward. There is no trace of the formation of a loop supplied by the posterior mesenteric vessel, which is the most striking Accipitrine character.

Coraciiformes.

Of the birds in this group that I have examined, the Owls (fig. 22) and Caprimulgidæ are the most primitive, and indeed differ very little from the primitive type. The duodenal loop, as in other Coraciiform birds, is very wide, especially towards its extremity. The circular loop of the gut remains in nearly the primitive con-

Fig. 22.

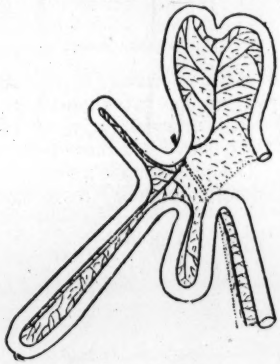


Bubo maximus; intestinal tract.

dition, being thrown into a series of short convoluted lobes, supplied by radiating branches from the middle mesenteric vein. In *Bubo maximus*, where the gut is relatively short, the only subsidiary loop of the mid-gut series that is prominent is the distal loop, along which, as in the common type, the large cæca run forward. In other Owls there is frequently another well-developed subsidiary loop on the part of the mid-gut between the duodenum and the vestige of the yolk-duct. The rectum is straight. The three branches of the portal vein, the duodenal, median, and posterior mesenteric veins, all are in the typical condition. I have not been able to see many of the other birds in this group which possess long cæca. Those without functional cæca display very simple divergences from the common

type. The wide gut is very short: the Colies, for instance, have shortest guts of any birds that I have examined; but the same general features are present in all. *Rhytidoceros plicatus*, for instance (fig. 23), shows the duodenum as a very wide irregular

Fig. 23.

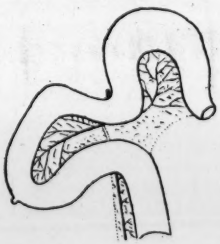


Rhytidoceros plicatus; intestinal tract.

loop, with a pucl er at its closed end. The circular part of the gut is thrown into three simple subsidiary folds. The first of these corresponds to that present in most Owls, but absent in the Eagle-Owl; the second bears the yolk-sac vestige at its extremity, and the third corresponds to the part along which the lost cæca lay. The rectum is straight. The veins are in the typical form, and I have not found any short-circuiting veins.

In the Woodpeckers (*Gecinus*) and Toucans (*Rhamphastos*) the duodenum is equally wide: the three loops of the mid-gut are present with the yolk-sac vestige on the median loop; but all three loops are much wider and shallower than in the Hornbill. The

Fig. 24.



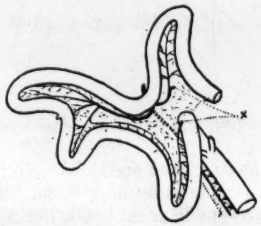
Colius capensis; intestinal tract.

Colies (fig. 24) have the same parts, but still wider and shallower. At first sight the gut of the Coly seems very different from that of the Hornbill. But the vestige of the yolk-duct orients the apex of the middle subsidiary loop of the mid-gut: the anterior and posterior loops of the mid-gut may then be seen as simple shallow curves on the gut. The wide duodenum and the straight rectum, and the veins, are as in the Hornbill and Woodpecker.

Passeriformes.

I have proceeded only a short way in the examination of the members of this vast group, but those that I have examined show a simple and identical modification of the common type. *Parus major* (fig. 25) may serve as a fairly generalized example of the Passerine type. The duodenum is a simple loop. The circular coil of the mid-gut shows a tendency to be spirally twisted, the

Fig. 25.



Parus major; intestinal tract. *x*, short-circuiting vessel divided.

vestige of the yolk-duct forming the apex of the spiral, and the median mesenteric vein forming the axis of the spiral. The spiral is hardly visible in *Parus*; it forms less than half a turn. In the Crows and Nutcrackers, and in a very large number of other Passeres, the spiral is long and forms several turns. Between the spiral and the rectum there is a subsidiary loop on the mid-gut where in the primitive type the cæca ran forwards. This in *Parus* and in all other Passeres I have examined is closely connected with the duodenum, which is folded under it. Frequently a lobe of the pancreas passes across and lies in this subsidiary loop. The loop has a recurrent vein from the middle mesenteric vein, and a short-circuiting vein or veins opening into the duodenal vein. The rectum is short and straight, and where these are present, as in *Parus*, bears the cæca. The veins are normal.

Some Passeres, as, for instance, the Nutcracker, show signs of a subsidiary loop of the mid-gut between the spiral and the duodenum. In others, as, for instance, the Poë Honey-eater (*Prosthemadera*), the anterior part of the mid-gut and the spiral are reduced to practically a simple fold, while the last loop of the mid-gut is considerably expanded.

Conclusion.

I do not feel justified in attempting to draw any general conclusions as to the relations of the various divergences from the common type that I have described; but I think that I have brought together enough matter to show that when a much larger number of facts has been collected, the method of investigation I have been following may furnish another clue to that riddle of zoology, the classification of birds. But in addition to this systematic interest, the comparative anatomy of a group of creatures so large in numbers and so alike in anatomical structure offers a field for the investigation of the innumerable divergences and convergences that have taken place in the evolution of the group. I cannot see that interpretations of isolated characters have any value. When we know the comparative anatomy of the greater number of characters that make up an animal, and not only those that seem to distinguish it as a species, the time may come for interpretation. But to those who care for discussions concerning isolated characters, I may suggest the problem: in these loopings of the gut in birds, there is an almost kaleidoscopic variety, and apparently these varieties are of systematic value; what are their utilities?

4. Myology of Rodents.—Part II. An Account of the Myology of the Myomorpha, together with a Comparison of the Muscles of the various Suborders of Rodents. By F. G. Parsons, F.R.C.S., F.Z.S., F.L.S., Lecturer on Comparative Anatomy at St. Thomas's Hospital.

[Received December 14, 1895.]

The present paper is intended to be a second instalment to the one "On the Myology of the Sciuromorphine and Hystricomorphine Rodents," which I had the honour of reading before this Society in 1894 (see P. Z. S. 1894, p. 251). I am again indebted to the kindness of the Society's Prosector, Mr. F. E. Beddard, for a large proportion of my material; indeed, it was his suggestion that a detailed examination of the muscles of Rodents would be of practical value in the Dissecting-Room at the Gardens that determined me to undertake the work in the first instance.

The first part of this paper contains an account of the muscles of thirteen Myomorphine Rodents, and as a statement of actual facts will, I hope, prove of some value.

The second part is devoted to a series of summaries and generalizations founded upon the facts with which these and previous dissections have furnished me. This part I regard as of less value than the first, because future dissections may make many alterations necessary. It seems well, however, to take stock of the mass of material from time to time as it accumulates.

The following is a list of the animals dissected for the first part of the present paper:—

Myoxus dryas.
Gerbillus shawi.
Cricetus frumentarius.
Cricetomys gambianus.
Microtus amphibius.
Myodes lemmus.
Mus decumanus.
Mus rattus.
Mus barbarus.
Rhyzomys badius.
Georychus capensis.
Bathyergus maritimus.
Heteromys longicaudatus.

Also

Lepus timidus and *Lepus cuniculus*

for the sake of comparison.

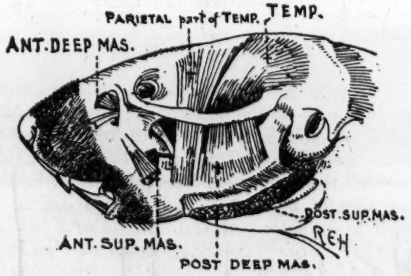
Accounts of the muscles of other animals by various authors have been used and their sources acknowledged in the text.

Muscles of the Head and Neck.

Temporal.—In all the Myomorpha the three parts of the temporal are more closely fused than they are in the Sciuromorpha, in this respect resembling the Hystricomorphine arrangement.

In the Water-Vole the parietal part of the muscle is very large and arises from the temporal fascia, as well as the parietal, maxillary, and frontal bones. It runs down as a flat tendon to be inserted, opposite the anterior molar teeth, into the mandible. The anterior deep part of the masseter, after coming through the infraorbital foramen, joins this tendon.

Fig. 1.



Masticatory muscles of Vole.

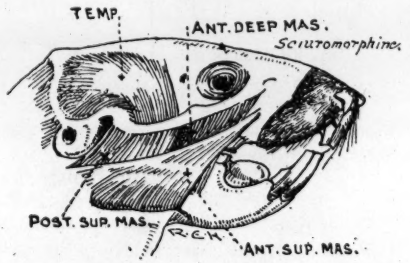
In the Myoxidæ and Muridæ the muscles of opposite sides are separated by an interval which is often, as in *Mus rattus*, of considerable extent. In the Spalacidæ, on the other hand, the two muscles rise close together, and the superficial layer described by Allen [1] is distinct and rises by aponeurosis from the sagittal crest. These animals, moreover, bear out the statement in Bronn's

[1] Pr. Acad. Nat. Sc. of Philadelphia, vol. iii. p. 385.

'Thierreich,' that the size of the temporal varies inversely with that of the eyes, for in them the eye is rudimentary while the muscle is very large (*Rhizomys*, *Georychus*, *Bathyergus*).

Masseter.—The four parts of the muscle already described are present in the Myomorpha, but the posterior superficial and posterior deep parts are usually difficult to separate satisfactorily. The anterior superficial portion is constant and rises in front of the infraorbital foramen, from the side of the maxilla, by a narrow tendon. It is very strongly marked in the Spalacidæ, in which the lower jaw has a broad pulley-like groove under which the muscle passes to be inserted into the inner surface of the bone; this arrangement is very well seen in *Georychus* and *Bathyergus*. The anterior deep part shows an intermediate arrangement between the Sciuromorphine and Hystricomorphine type and throws a

Fig. 2.

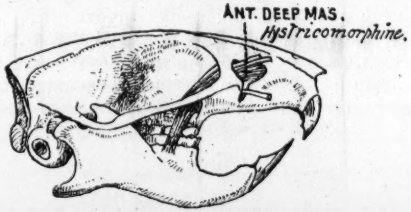


Superficial dissection of Hamster's masseter.

good deal of light on the morphology of this portion. In the Hystricomorpha there is a large infraorbital foramen through which the anterior deep part of the masseter passes to be inserted by a narrow flat tendon into the mandible opposite, or just in front of, the anterior cheek-teeth. In the Sciuromorpha the part which I have hitherto described as "anterior deep" rises from a vertical groove in front of the zygoma, and passes down to the same insertion without traversing any bony canal, the infraorbital foramen being only large enough to allow the passage of the nerve. As the insertion of a muscle is justly regarded as of more importance than the origin in determining homologies, I have hitherto looked upon these two portions as homologous, but the arrangement in many of the Myomorpha has made me change this opinion. In the Myomorpha the infraorbital foramen is intermediate between the arrangement found in the other two suborders; it is usually present as a vertical slit, through which passes a small bundle of muscular fibres corresponding to the anterior deep part of the Hystricomorphine masseter; but in addition to this there is another slip, corresponding to the Sciuromorphine anterior deep part, which rises in front of the zygoma

and runs down to be inserted, also by a narrow flat tendon, just external to the former and covering its insertion. This part is especially well marked in *Heteromys*. This arrangement, which is present in all the genera of the Muridæ that I have dissected, shows that, as the two muscles coexist in the same animal, they cannot be homologous, and I am now of opinion that the so-called

Fig. 3.



Deep dissection of Hamster's masseter.

Fig. 4.

Masseter of *Heteromys*.

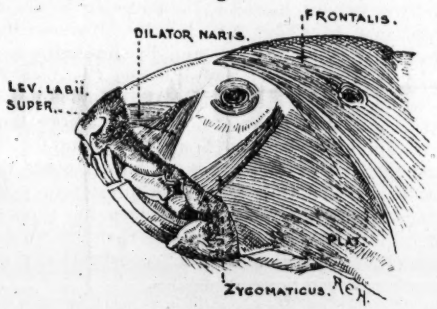
anterior deep part of the Sciuromorphine masseter is an extension forward of the posterior superficial plane of fibres. The arrangement in the Spalacidæ gives a clue to the way in which the infraorbital slip appears; in these animals it is very feebly marked, rises from the margins of the infraorbital foramen, and runs back to blend with the temporal instead of having an independent insertion opposite the anterior cheek-teeth.

Facial Muscles.—These muscles are best developed in the Spalacidæ, especially in *Bathyergus*. In this animal the frontalis is continuous dorsally and laterally with the superficial panniculus, and the muscles of the small auricle are extensions from this. The orbicularis palpebrarum in *Bathyergus* is very small, corresponding to the feeble development of the eye. The levator labii superioris corresponds with the description of it in the other Rodents[1]. The dilatator naris rises deep to this and passes to the

[1] P. Z. S. 1894, p. 253.

side of the nasal aperture. The zygomaticus rises behind and below the eye and runs to the angle of the mouth. The orbicularis oris is feeble, as the mouth never closes over the enormous lower incisors, and the infra-labial muscles are hardly developed at all.

Fig. 5.



Face-muscles of *Bathyergus*.

This description applies to the other animals examined, with the exception that a depressor labii inferioris can be made out, and that the orbicularis palpebrarum is better developed than in the Spalacidæ. The other facial muscles, especially the zygomaticus, are more difficult to separate from the facial panniculus. Windle, however, made out a levator alæ nasi, a dilatator naris, and a levator labii inferioris in *Hydromys chrysogaster*[1].

Buccinator.—The buccinator has the normal arrangement, except in *Cricetomys* and *Cricetus*: in the former animal I was unfortunately unable to examine the face owing to its damaged condition; in the latter the muscle is prolonged into a pouch which runs back along the side of the neck as far as the scapula, at its blind extremity a muscular fasciculus is attached to it, which runs backward to the posterior thoracic spines parallel to the posterior border of the trapezius, of which it seems a part, as it is supplied by a continuation of the spinal accessory nerve coming out of the trapezius. The action of this muscle would be to draw back the pouch and possibly to assist in emptying it.

Pterygoids.—The description of these muscles already given applies to the arrangement in the Myomorpha. In the Spalacidæ, especially in *Bathyergus*, the large anterior superficial part of the masseter is inserted into the inner surface of the mandible above the insertion of the internal pterygoid, so that the latter seems to stand out in a more isolated manner than is usually the case.

Digastric.—Distinct Hystricomorphine and Sciuromorphine types of this muscle have already been described. In the Myomorpha the type is usually Sciuromorphine, but certain

[1] P. Z. S. 1887, p. 54.

animals approach more or less closely to the Hystricomorphine arrangement.

In *Myoxus* the type is essentially Sciuromorphine, there is a distinct central tendon and a tendinous arcade connecting the anterior bellies of opposite sides; the two anterior bellies, moreover, are in contact in the middle line. The same arrangement is found in *Gerbillus* (where, however, the posterior bellies rise from the bulla tympani), in *Cricetomys*, in the Murinæ (*Mus rattus*, *M. decumanus*, and *M. barbarus*), and in *Rhizomys* among the Spalacidæ. In *Cricetus*, *Microtus*, *Myodes*, and *Hydromys* (Windle) the central tendon is reduced to a mere tendinous intersection as in the Hystricomorpha, but the two anterior bellies are still in close contact. In *Bathyergus* and *Georychus* among the Spalacidæ a similar arrangement is found, but, as in all other cases, the double nerve-supply of the muscle is preserved. *Heteromys* approaches most nearly to the Hystricomorphine type, since the two anterior bellies are not in contact and there is no tendinous arcade; there is, however, a distinct constriction and tendon between the anterior and posterior bellies.

Transverse Mandibular Muscle.—This muscle is present in all cases; it is perhaps better developed in the Muridæ than in the other families. When the mylo-hyoid comes far enough forward the transverse mandibular is superficial to it.

Mylo-hyoid.—The mylo-hyoid is attached posteriorly to the tendinous arcade connecting the digastrics and to the hyoid bone. Anteriorly the two muscles usually form a **V**-shaped border, with the aperture of the **V** forward, and do not reach the symphysis. In *Myoxus*, *Microtus*, the Murinæ (*M. rattus*, *decumanus*, and *barbarus*), and in *Heteromys* the muscle extends farther forward than in the rest and is then deep to the transverse mandibular.

Genio-hyoid.—The two muscles of opposite sides tend to coalesce posteriorly as in the Sciuromorpha.

Genio-hyo-glossus.—This has the usual attachments; it is specially large in *Rhizomys*.

Styloid Muscles.—The stylo-hyoid has the usual Rodent arrangement in passing deep to the digastric.

In *Rhizomys* these two muscles are closely blended, while in *Georychus* the blending seems to be more complete, for no distinct stylo-hyoid could be made out. The stylo-glossus rises by tendon from the posterior part of the bulla; it is very well marked in *Cricetomys*, while in *Georychus* and *Bathyergus* it rises by tendon from the stylo-hyal element of the hyoid arch. As in other rodents the stylo-pharyngeus was not seen as a distinct muscle.

Sterno- and Cleido-mastoid.—In the Myomorpha these two muscles are perhaps not quite so distinctly separated one from another as in either of the other suborders.

In *Cricetus*, *Myoxus*, *Microtus*, *Myodes*, *Mus barbarus*, *M. rattus*, and *Heteromys* the cleido-mastoid rises from the inner part of the bony clavicle under cover of the clavicular insertion of the trapezius; it is inserted into the curved line of the occipital bone, close to the

paroccipital process, by fleshy fibres. The sterno-mastoid has the usual origin and is inserted by tendon into the base of the paroccipital process in front of the last muscle; it is the larger muscle of the two. In *Cricetomys* the cleido-mastoid is not covered by the trapezius at its origin, it is, however, overlapped by the sterno-mastoid at its insertion. In the Gerbille the two muscles are continuous at their origin, the cleido-mastoid being the larger and rising from the inner half of the clavicle. *Rhizomys* resembles *Cricetus*, *Myoxus*, and the *Murinæ* in the origin of the cleido-mastoid being overlapped by the trapezius, and *Cricetomys* in the insertion being overlapped by the sterno-mastoid. In *Hydromys* [1] the cleido-mastoid is the smaller muscle and is overlapped at its insertion by the sterno-mastoid. In *Georychus* and *Bathyergus* the cleido-mastoid is not overlapped by the trapezius; in the latter the two muscles tend to fuse as in the Gerbille, but to a greater extent; at their insertion they are completely fused and are attached by a narrow tendon to the base of the paroccipital process.

Sterno-hyoid and thyroid.—In most cases these muscles have the human attachments. In *Bathyergus*, however, the sterno-hyoid misses the hyoid bone and continues on to the symphysis menti, in this respect somewhat resembling the arrangement found in *Myopotamus* [2]. In *Hydromys* the arrangement seems identical with that of *Myopotamus* [3].

Omo-hyoid.—As in the Sciuromorpha the omo-hyoid is always present in the Myomorpha; it has the same attachments, never, as far as I have seen, being attached to the clavicle. There is no central tendon. In *Bathyergus* the muscle is not attached to the hyoid bone, but is continued forwards with the sterno-hyoid to the symphysis menti.

Levator Claviculæ (*Acromio-trachelian*).—In all the animals examined this muscle rose from the anterior arch and transverse process of the atlas. Its usual insertion is into the acromial process, but sometimes it extends to the spine of the scapula. This description applies also to *Hydromys* [3]. In *Bathyergus* the muscle is very large and extends from the acromion on to the outer half of the clavicle at its insertion, in this respect resembling the Dipodidæ.

Rectus Capitis Anticus Major and Minor and Longus Colli.—These muscles have the Hystricomorphine attachments.

Scalene Muscles.—A scalenus anticus, that is a muscle passing to the first rib in front of the subclavian artery and brachial plexus, was only seen in the following animals—*Gerbillus*, *Georychus*, and *Bathyergus*. In these it resembled the same muscle among the Hystricomorpha, in rising from the basioccipital bone. The scalenus medius and posticus of human anatomy are represented by one mass, which rises from the transverse processes of all the cervical vertebræ, passes behind the brachial plexus, and is inserted into

[1] P. Z. S. 1887, p. 55.
[2] P. Z. S. 1894, p. 256.
[3] P. Z. S. 1887, p. 55.

the first four or five ribs. In *Cricetomys*, *Gerbillus*, *Microtus*, *Mus rattus*, *Myodes*, and *Heteromys* the muscle rose from all the cervical vertebræ and was inserted into the first five ribs. In *Myoxus* and *Cricetus* it was only inserted into the first four ribs. In *Georychus* the muscle came from the anterior four cervical vertebræ and was inserted into the first four ribs. In *Bathyergus* the arrangement was the same except that it reached the fifth rib. In *Rhizomys*, although there was no scalenus anticus, the scalene mass was

Fig. 6.

Scalene muscles of *Rhizomys*.

divisible into an anterior and a posterior part: the anterior part rose from the second to the seventh cervical transverse processes and was inserted into the first rib, while the posterior part only came from the transverse process of the atlas and went to the first four ribs.

Muscles of the Anterior Extremity.

The Pectoral Muscles.—For purposes of description, and for comparison with other Rodents, the same four divisions of the pectoral mass which have already been defined [1] will be here adhered to. The chief differences noticed in the Myomorpha are that α is not so oblique a muscle, and, as its fibres correspond in direction with those of β, the two parts are much less easily distinguished from one another. In *Cricetomys*, with which *Myoxus* closely agrees, α rises from the anterior part of the sternum and runs horizontally outward to be inserted into the pectoral ridge;

[1] P. Z. S. 1894, p. 259.

β rises from the whole length of the sternum; γ (the abdominal fibres) are feebly marked; δ (the part corresponding to the pectoralis minor) comes from the lower true rib-cartilages and runs forward and outward to the head of the humerus and to the coracoid process. *Heteromys* only differs from this description in having the abdominal fibres more closely united with the panniculus than in any other animal. In the Gerbille, α and β are fused, while γ and δ unite near their insertion, which is into the capsule of the shoulder and into the humerus just internal to the pectoral ridge. The Hamster differs from the last only in having the abdominal fibres better developed and running quite separately to the coracoid process. The Vole closely resembles the Gerbille, but is remarkable for the great development of the fibres from the cartilages (δ); these fibres unite with γ, and are inserted into the coracoid.

In the Rat and Mouse the arrangement is almost identical with that of the Gerbille.

In *Siphneus* Milne-Edwards describes a large and distinct pectoralis minor inserted into the coracoid process and coming from the second rib; this is interesting when one notices the similar arrangement in the Vole, an animal to which he regards *Siphneus* as being more closely related than to the Mole-Rats [1].

Rhizomys resembles *Cricetomys* except that δ is larger, rises from the 2nd to the 7th costal cartilages, and is inserted into the clavicle as well as the head of the humerus. *Georychus* has α and β fused; γ is inserted into the neck of the humerus; δ rises from the 2nd, 3rd, and 4th costal cartilages and is inserted into the coracoid and shoulder-joint.

In *Bathyergus* the pectoral mass is very large, and resembles the last in having α and β fused; but near the insertion the posterior fibres become tucked under the anterior and are inserted deep to them into the pectoral ridge. The abdominal fibres (γ) rise from the end of the sternum to the middle of the linea alba; they are inserted together with a large part of the latissimus dorsi into the capsule of the shoulder. The pectoralis minor (δ) rises from the posterior two-thirds of the sternum and the posterior true rib-cartilages, and is inserted into the outer half of the clavicle, having its anterior border in contact with the posterior border of the subclavius; between these two contiguous borders the external anterior thoracic nerve emerges to reach the superficial parts of the muscle.

Sterno-scapularis.—In the greater number of the Myomorpha this muscle is only represented, as in Man, by the subclavius, which rises from the cartilage of the first rib and is inserted into the outer half of the posterior border of the clavicle. *Georychus* and *Bathyergus* are the only exceptions which I have met with; in these there is a large and distinct claviculo-scapularis, as in the Hystricomorpha. In *Siphneus*, according to Milne-Edwards, the arrangement is the same.

[1] 'Recherches des Mammifères,' tome i. p. 99.

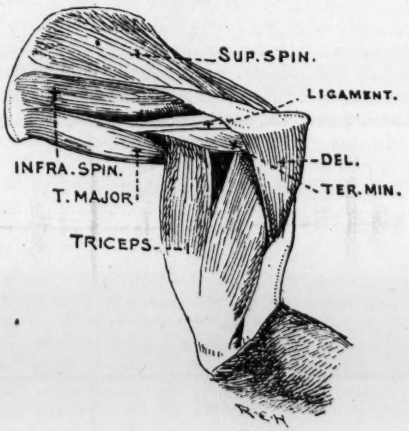
Deltoid.—This muscle in the Myomorpha has the usual three parts, but the intervals between them are hardly noticeable; moreover, they are all inserted into the humerus at the same point. The portion rising from the spine of the scapula, instead of being the smallest, as in the Hystricomorpha, is usually the largest. This description applies to all the animals examined, with the exception that in *Bathyergus*, *Georychus*, and *Siphneus* the intervals are so ill-marked that the muscle appears single as in Man.

Supraspinatus, Infraspinatus, and Subscapularis.—These resemble the same muscles in the other Rodents in having the human attachments. In some, e. g. *Cricetomys*, the supraspinatus is larger than the infraspinatus; but, as a rule, the reverse is the case. Milne-Edwards points out that in *Siphneus* the supraspinatus only occupies the anterior three-fourths of the fossa, the posterior part giving attachment to the rhomboid.

Teres Major.—This has the usual attachments, its relation to the tendon of the latissimus dorsi is variable, and depends on the extent to which that muscle is wrapped round the lower border of it. In *Myoxus*, *Cricetus*, *Rhizomys*, *Microtus*, *Mus barbarus*, and *M. rattus* the teres major is wrapped round by the latissimus dorsi, so that the latter is inserted anteriorly to it. In *Cricetomys*, *Georychus*, and *Bathyergus* the wrapping round is not so complete, and the teres major is inserted in front of the latissimus dorsi. In *Siphneus* the arrangement seems to be the same.

Teres Minor.—This muscle closely agrees with the description given of it in the other Rodents. It is very rarely a distinct muscle, *Cricetomys* being the only animal in which it could be described as well-marked. It is interesting to notice that a strong

Fig. 7.



Shoulder-muscles of *Rhizomys*.

ligament was seen in *Rhizomys* running from the axillary border of the scapula, between the origins of the teres major and minor, across the latter muscle to the metacromion process. A similar ligament has already been described in *Lagostomus*[1].

Biceps Cubiti.—There can be no doubt that, speaking generally, one of the characteristics of the Myomorpha is a double-headed biceps. This was noticed in every specimen which I dissected. Milne-Edwards, however, found only one head in *Siphneus*, but it is possible that further investigation may prove that this was merely an individual variation. In *Hydromys* Windle does not notice the condition of the biceps.

As a rule the insertion is into both bones of the forearm, but in *Cricetus* and *Myoxus* the muscle only goes to the radius, while in *Rhizomys* the ulna is the only bone to which it is attached. In *Georychus* and *Bathyergus* the two heads are easily separable down to the insertion by a little force. In the former the coracoid head goes entirely to the radius, the glenoid head to the radius and ulna; in the latter both heads can be traced to both bones.

Coraco-brachialis.—In the Myomorpha the most usual arrangement is to find the second and third parts, described by Wood[2], present; they are, however, fused, and the muscle has one continuous insertion from the middle of the humerus to the internal condyle. This description applies to *Rhizomys*, *Siphneus*, *Microtus*, *Myodes*, *Heteromys*, *Hydromys*, and the Murinæ. The Cricetinæ (*Cricetus* and *Cricetomys*) have the same arrangement, but in addition the first part or rotator humeri is present. In *Gerbillus* and *Myoxus* only the second part was seen.

In *Georychus* the muscle was absent, while in *Bathyergus* it was very small, and was only represented by the second part. Milne-Edwards says that the muscle is absent in "le Rat-Taupe du Cap," by which, I suppose, *Bathyergus* is meant. In all the animals dissected, as in other Rodents, the musculo-cutaneous nerve passes above the second part of the muscle.

Brachialis Anticus.—All the Myomorpha have the external and internal heads of the brachialis anticus, and these are more or less completely fused; perhaps *Bathyergus* shows them most clearly separated from one another. The insertion, in every case that I dissected, was into the ulna only, but Milne-Edwards describes an additional feeble attachment into the head of the radius in *Siphneus*.

Triceps and Anconeus.—There is no difference between the Myomorphine triceps and that of other Rodents. In *Cricetomys* it was noticed that the outer head was inserted largely into the fascia of the outer side of the forearm. *Bathyergus* resembles *Castor* in the great development of the muscle, and in the fact that it is attached to both sides of the olecranon, as well as to the top. The anconeus has the usual attachments, and shows nothing of special interest.

[1] P. Z. S. 1894, p. 263.
[2] Journ. of Anat. vol. i. p. 45.

Epitrochleo-anconeus.—This is present in all the Myomorpha; it is supplied by the ulnar nerve.

Pronator Radii Teres.—This muscle agrees with the description given of it in other Rodents; in *Mus barbarus* and *Cricetus* it is inserted into the second quarter of the radius, while in all the other animals examined it goes into the middle of that bone. *Cricetomys* resembles *Sciurus* in possessing a supracondylar foramen, but in it the pronator teres does not rise from the supracondylar arch, as it does in *Sciurus*.

Flexor Carpi Radialis.—The attachments of this muscle were normal in all cases. In the Vole, and, to a lesser extent, in all Rodents, the tendon of this muscle is bound down to the flexor surface of the radius by a fibrous pulley just below the attachment of the pronator radii teres.

Palmaris Longus.—The muscle is present and large in *Cricetomys*, *Cricetus*, *Microtus*, *Georychus*, *Bathyergus*, *Mus rattus*, *Siphneus*, and *Heteromys*; it is inserted into the palmar cartilage or ossicle and into the fascia of the palm. In *Rhizomys* and *Gerbillus* it is only inserted into the fascia, while in *Myoxus* it is absent. In *Mus barbarus* it is developed as a slip from the surface of the flexor sublimis digitorum, an arrangement which recalls that found in *Cœlogenys* and *Xerus*.

Flexor Sublimis Digitorum.—In all the animals examined, except *Myoxus*, this muscle rises from the internal condyle and forms the flexor perforatus for the 2nd, 3rd, and 4th digits. In *Myoxus* it also goes to the 5th digit. Milne-Edwards describes the slip to the 2nd digit as a distinct muscle in *Siphneus*.

Flexor Carpi Ulnaris.—This muscle has the usual attachments, except that in *Rhizomys* and *Bathyergus* the origin from the internal condyle is wanting. The tendon is specially thick in *Georychus*.

Flexor Profundus Digitorum.—The deep flexor of the fingers is composed, as in other Rodents, of two superficial heads from the internal condyle and of two deep heads from the flexor surfaces of the radius and ulna. A small slip is given off to the pollex from the front of the tendon formed by these heads in *Cricetomys*, *Gerbillus*, *Microtus*, *Mus barbarus* and *rattus*, *Myodes*, *Georychus*, *Bathyergus*, and *Rhizomys*. In *Myoxus*, *Cricetus*, and *Siphneus* (Milne-Edwards) no tendon goes to the thumb. In *Bathyergus* the fibres derived from the different heads were traced downward through the tendon, and it was found that the two condylar heads join together to form the superficial part of the tendon, which gradually winds round the outer side to eventually become deep. When the tendon divides into its ultimate five slips for the four fingers and the thumb, each slip receives fibres both from the condylar and the radio-ulnar origins. This twisting of the tendon reminds one of the arrangement of the fibres of the tendo Achillis[1]. There are usually four lumbricals which arise from the flexor surface of the tendon at or before its point of division.

[1] Author's paper, 'Journ. Anat.' vol. xxvii. p. 414.

In *Microtus*, *Rhizomys*, *Bathyergus*, and *Hydromys*, however, only three lumbricals were seen, the radial one having been suppressed.

Pronator Quadratus.—This muscle is less well developed as a rule than in the Hystricomorpha, never, so far as I have seen, extending along the length of the bones. In *Myoxus* and *Microtus* it occupies the middle third of the forearm; in *Cricetomys*, *Cricetus*, and *Mus barbarus* the lower half. In the Gerbille it attains its maximum of development, and is attached to the lower three-quarters of the two bones. In *Georychus*, *Bathyergus*, *Rhizomys*, and *Siphneus* it is a very feeble muscle—in the two former being found only opposite the insertion of the pronator radii teres, while in the two latter it is represented by a few fibres between the lower ends of the two bones.

Supinator Longus.—This muscle was wanting in every animal dissected. Windle found it absent in *Hydromys*, and Milne-Edwards says that it is also wanting in *Siphneus*, *Spalax*, and *Helamys*. He states, however, that it is present in the Hamster, and, although it was most certainly absent in the Hamster I dissected, I take his statement to mean that very occasionally a supinator longus may be found among the Myomorpha as a reversion to the Sciuromorphine type.

Extensor Carpi Radialis Longior and Brevior.—In all the animals examined these muscles had the usual attachments. When there is any difference in size, as in the case of *Myoxus*, *Georychus*, *Rhizomys*, and *Siphneus*, the brevior is the larger muscle. Milne-Edwards says that in *Georychus* and *Spalax* there is only one radial extensor, but he does not mention where that one is inserted. Unless the insertion is carefully looked for the two muscles may easily be mistaken for one, as they lie very close to one another.

Extensor Communis Digitorum.—The only point of interest in the Myomorphine common extensor is whether it goes to the fifth digit or not. In *Georychus*, *Bathyergus*, *Siphneus*, and *Mus barbarus* no slip is given to the little finger. In *Cricetomys* two tendons pass to the middle, and in *Rhizomys* two to the ring finger.

Extensor Minimi Digiti.—The insertion of this muscle was into the fourth and fifth fingers in *Gerbillus*, *Microtus*, *Myodes*, *Mus barbarus*, *Hydromys*, *Georychus*, *Bathyergus*, and *Rhizomys*. In *Bathyergus*, however, the tendon to the fourth digit was very small. In *Cricetus* it was attached to the third and fifth digits, while in *Myoxus* and *Cricetomys* it only went to the fifth.

Extensor Carpi Ulnaris.—Nothing special was noticed in the attachments of this muscle. Milne-Edwards describes it as a double muscle in *Siphneus*, one tendon going to the base of the fourth, and the other to the base of the fifth metacarpal bone, at the same time he does not describe any extensor minimi digiti. Considering the very constant character of the extensor carpi ulnaris in Rodents, and the comparative inconstancy of the extensor minimi digiti, I expect that the explanation of what he

found is that the outer division of his extensor carpi ulnaris is really the extensor minimi digiti, the tendon of which has lost its digital attachments and has become inserted into the base of the fourth metacarpal bone.

Supinator Brevis.—The description of this muscle given in the other Rodents applies to the Myomorpha, with the exception that in the latter a sesamoid bone is usually found in the tendon. The only animals in which this bone was wanting were *Bathyergus* and *Georychus*. The relationship of the tendon of the supinator brevis to the external lateral ligament of the elbow is interesting, in some cases, as in that of *Bathyergus*, there is a well-marked external lateral ligament, situated behind the tendon, but in others, of which *Cricetomys* is an example, the tendon itself seems to form the lateral ligament, and has the orbicular ligament attached to it.

Extensor Ossis Metacarpi Pollicis.—In all cases this muscle rises from both bones, and is inserted into the base of the metacarpal bone. In the Gerbille its tendon was double. In *Cricetus* and *Cricetomys* it had an extra insertion into the radial sesamoid bone or palmar cartilage.

Extensor Primi Internodii Pollicis.—In every animal examined this was absent.

Extensor Secundi Internodii Pollicis.—This muscle was only seen in *Georychus*, where it was well-marked, it accompanied the extensor indicis and separated on the back of the hand. This arrangement is practically the same as that already described in *Castor*.

Extensor Indicis.—As in other Rodents the extensor indicis rises from about the middle of the back of the ulna, and is inserted only into the dorsal side of the index. In *Myoxus* it rises from the top of the back of the ulna close to the olecranon. In the Vole I dissected the tendon had acquired a secondary attachment to the prominent ridge on the back of the radius at its lower end, while the part of the tendon between this and the index was wanting.

Palmaris Brevis.—When a palmar ossicle is present, which is not so often the case as in other Rodents, the muscle is attached to it. When there is no ossicle it is attached to the palmar fascia. In *Microtus* and *Bathyergus* no palmaris brevis was found.

Flexor Brevis Digitorum Manus.—This muscle was found in *Cricetomys*, *Cricetus*, *Georychus*, and *Bathyergus*. In the first three it arose from the palmar ossicle, but in the last from the fascia just external to the pisiform bone.

Muscles of the Thumb.—In almost all cases the abductor pollicis can be made out, and has its origin from the palmar ossicle. The flexor brevis was made out with difficulty in *Myoxus*, *Georychus*, and *Bathyergus*; in the two latter the thumb is provided with a pair of sesamoid bones, as in all the other fingers. *Bathyergus* has a prominent cartilaginous spur on the outer and inner side of the hand; these probably represent the prepollex and postminimus.

In no case could I satisfy myself of the existence of an adductor or opponens pollicis.

Muscles of the Little Finger.—These are not so easily made out as in the other Rodents. The abductor is present, but is not double. The flexor brevis is represented by the ulnar slip of the interosseus muscle to the little finger, when there happens to be a muscle in that position. I have never been able to find an opponens, although Windle describes it in *Hydromys*.

Interossei.—In all the animals examined, except *Georychus* and *Bathyergus*, there were eight interossei, the inner of which formed the flexor brevis minimi digiti. In these two animals there were no interossei attached to the fifth finger, although the two sesamoid bones supposed to be developed in them were present. Practically the same arrangement was found in the Beaver. In *Cricetomys*, *Microtus*, and possibly in *Cricetus*, there was an adductor minimi digiti, which recalls the figure already published [1] of the same muscle in *Cœlogenys*. In *Rhizomys* and *Gerbillus* there is an adductor indicis. These two muscles are situated on a plane superficial to that of the interossei, and I have not come across any Myomorphine animal which possesses both of them, although they frequently co-exist in the Hystricomorpha.

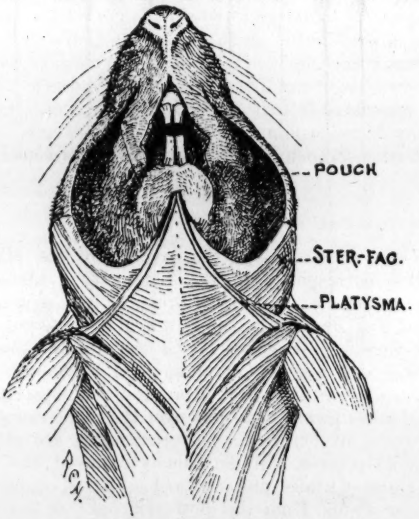
Muscles of the Trunk.

Panniculus Carnosus.—In the majority of the Myomorpha the panniculus corresponds to the rodent type already described. The sterno-facialis is always present, but seldom large. In *Georychus* and *Bathyergus* the panniculus, especially the anterior part, is very well developed; in the former the platysma is very strong and rises from the angle of the mouth and from the median raphe running back from the symphysis menti, it runs backward and upward to be lost over the region of the shoulders, though some of the more posterior fibres are attached to the metacromial process. When this is removed, the whole length of the sterno-facialis and epitrochleo-facialis comes into view, the former rising from the posterior half of the sternum, the latter from the internal condyle of the humerus; they both run forward to be inserted into the fascia on the surface of the masseter. In *Bathyergus* the sterno-facialis has undergone greater development, and is continuous posteriorly with the panniculus of the abdomen; this I have figured, and have pointed out [2] that it is a possible foreshadowing of the human sternalis muscle. The posterior part of the panniculus in *Bathyergus* is also well marked, and gets an attachment to the external tuberosity of the tibia and to the ramus of the ischium. In *Heteromys* among the Geomyidæ, the pouch causes a good deal of modification in the facial panniculus. The superficial part or platysma rises from the

[1] P. Z. S. 1894, p. 273.
[2] Journ. Anat. vol. xxix. p. xii.

surface of the pouch, and runs backward and upward under the ear to be lost on the back of the neck. When this is dissected away, there is seen to be a deeper layer of muscle having exactly the same direction, and also coming from the surface of the pouch. By far the larger portion of the outer wall of the pouch is formed by the sterno-facialis muscle, which is especially thick at the orifice forming a partial sphincter; the fibres of this muscle run downward and backward to be inserted into the anterior half of the sternum, superficial to the pectoralis major. There is no panniculus in the inner wall of the pouch, which consists solely of skin covering the masseter and buccinator muscles, with the

Fig. 8.

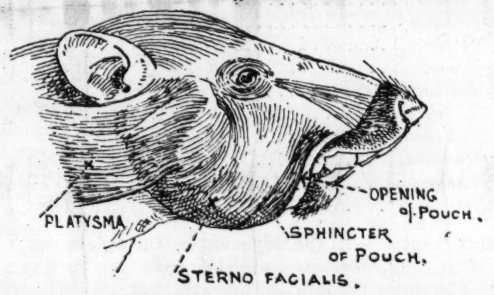


Pouch-muscles of *Heteromys*.

exception of one narrow slip which rises from the mental symphysis, runs round the inner side of the opening of the pouch, and when it reaches the lower margin turns sharply outward, superficial to the fibres of the sterno-facialis, to run to the side of the neck, where it joins the platysma. This decussation of the fibres guarding the outer and the inner side of the aperture gives a powerful sphincteric action by which the pouch can be closed at will. It is worth while to compare the anatomy of the pouch in the Geomyidæ with that in *Cricetus*, and to notice that, whereas in the former the pouch is formed by an invagination of skin probably perforating the platysma, so as to leave some of

that muscle on the inner side of the opening, while the pouch itself is deep to the whole of the panniculus, in the latter the

Fig. 9.



Pouch-muscles of *Heteromys*.

pouch is formed by an evagination of the buccinator, to the fundus of which a slip of platysma has become attached.

Latissimus Dorsi.—This muscle has the same attachments that it possesses in other Rodents; the dorso-epitrochlearis is always present, and reaches as far as the olecranon, though in *Cricetomys* it is also inserted into the fascia of the forearm.

Trapezius.—In most of the Myomorpha as in the Sciuromorpha there are three separate parts of the trapezius. The first of these, described by Milne-Edwards[1] and by Strauss-Dürckheim as the clavo-cucullaris, consists of the fibres passing between the occiput and the clavicle; it is separated from the rest of the muscle by the levator claviculæ, and was found in the following animals:—*Myoxus*, *Cricetus*, *Cricetomys*, *Microtus*, *Myodes*, *Mus decumanus*, *Heteromys*, *Bathyergus*, and *Siphneus*. In *Georychus* and *Mus barbarus*, however, this part of the muscle was not seen. The second part, or acromio-cucullaris, consists of the fibres running between the ligamentum nuchæ and the anterior thoracic spines on the one hand, and the acromial process and spine of the scapula on the other; it is usually separated from the third part or dorso-cucullaris by a pad of fat. In all the animals dissected, these two parts were separate with the exception of *Cricetomys* and *Myoxus*.

Rhomboidei.—The rhomboideus capitis is a distinct muscle, while the major and minor are not separable one from another. In *Cricetus*, *Myoxus*, *Microtus*, *Georychus*, *Bathyergus*, and *Heteromys*, part of the rhomboideus capitis rising from the outer part of the occipital curved line is separated from the rest and runs to the inner half of the spine of the scapula, covering part of the supra-spinatus instead of going to the vertebral border.

Serratus Magnus and Levator Anguli Scapulæ.—The origins of

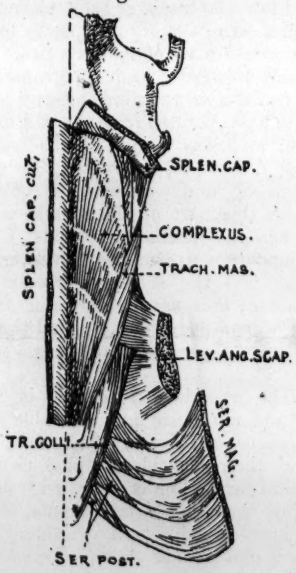
[1] 'Études pour servir, &c.,' p. 94.

these combined muscles in the various animals dissected are the following:—

Myoxus	2–7 c. v.	1–7 ribs.
Cricetus	3–7 „	1–7 „
Gerbillus	2–7 „	1–8 „
Microtus	2–7 „	1–8 „
Myodes	2–7 „	1–8 „
Mus barbarus	2–7 „	1–7 „
„ *rattus*	2–7 „	1–7 „
Rhizomys	1–7 „	1–8 „
Georychus	3–7 „	1–10 „
Bathyergus	3–7 „	1–10 „
Heteromys	2–7 „	1–8 „

Serratus Posticus.—In the Myomorpha the anterior part of this muscle is always present and well marked; it is usually inserted into the ribs from the 4th to the 7th, but in *Cricetomys* it is continued back to the 9th, and in *Rhizomys* to the 11th. In *Georychus* and *Bathyergus* it is inserted into the 6th, 7th, and 8th ribs. The posterior part of the serratus posticus was only seen in *Microtus*, *Bathyergus*, and *Myodes*; in the first it was inserted into the last 4, and in the two latter into the last 5 ribs.

Fig. 10.



Neck-muscles of Hamster.

Sacro-lumbalis and Longissimus Dorsi.—These muscles show nothing remarkable in their attachments.

Transversalis Capitis et Colli.—In *Myoxus* the trachelo-mastoid or transversalis capitis was absent, in all the other animals both muscles were found.

Splenius Capitis et Colli.—The splenius capitis rises from the ligamentum nuchæ nearly as far forward as the occiput, and almost entirely covers the complexus; it has the usual attachments. The splenius colli was not seen at all.

Complexus.—There is usually a slight tendency to longitudinal division, but this is not seen in *Georychus*, *Bathyergus*, *Myoxus*, or *Myodes*. *Cricetus* shows two intersections extending across the whole muscle, while in *Rhizomys* they only extend across the outer half of it.

Tail-Muscles.—In those animals which have tails, the arrangement of the muscles is the same as in other Rodents.

Obliquus Externus Abdominis.—This muscle usually rises from the posterior nine or ten ribs. The description already given of it in the other Rodents applies to the Myomorpha, with the exception that it never runs upward to the first rib with the rectus. The outer pillar of the abdominal ring is large and muscular, and is inserted into the whole length of the body of the pubes, external and parallel to the symphysis. The inner pillar is thin and fascial. In *Cricetomys* five or six lineæ transversæ were seen extending across the muscle from the rectus, while in *Microtus* the same thing was also noticed, but much less distinctly.

Obliquus Internus and Transversalis.—These muscles can be separated with great care. In *Bathyergus* they are very well marked, and in that animal the relation of the aponeurosis to the rectus can be made out, and is found to be as in Man. In *Mus rattus* the scrotal pouches are very large, and are composed entirely of the internal oblique.

Rectus Abdominis.—In all the specimens of the family of Muridæ examined there was a decussation resembling that already described in the Octodontidæ[1]; this was not seen in *Myoxus*, *Georychus*, or *Bathyergus*, though it was found in *Rhizomys*.

Supracostalis.—In no Rodent was this muscle seen.

Psoas Parvus.—The psoas parvus was present in all the specimens except the Gerbille; in *Microtus*, *Rhizomys*, and *Georychus*, however, it was small.

Psoas Magnus and Iliacus.—These muscles have the usual rodent attachments.

Quadratus Lumborum.—In most of the Myomorpha the quadratus lumborum does not seem to rise from as far forward in the dorsal region as it does in the other Rodents. It is attached to all the lumbar vertebræ except in the case of *Rhizomys*, where it only comes from the first three.

[1] P.Z.S. 1894, p. 280.

Muscles of Posterior Extremity.

Gluteus Maximus, Tensor Fasciæ Femoris, and Sartorius.—The description already given[1] applies perfectly to the Myomorpha; the tensor fasciæ and sartorius are, however, as a rule less well marked, and there is also a closer union between the posterior border of the gluteus maximus and the anterior border of the biceps femoris. The bony insertion of the gluteus maximus is into the middle of the femur except in *Cricetus*, where it is also attached to the external supra-condylar ridge of the femur, and in *Rhizomys*, where it is attached almost entirely to the third trochanter in the upper part of the bone. The sartorius and tensor fasciæ femoris are best marked in *Cricetus*, while in *Georychus* they are practically absent.

Gluteus Medius and Minimus.—These muscles present no differences from those already described in other Rodents.

Scansorius.—The scansorius is so closely fused with the gluteus minimus, that it is only possible to make it out as a distinct muscle in *Cricetomys*, though even there the separation is not very clear.

Pyriformis.—This muscle is also much more closely fused with the gluteus minimus than in the other Rodents; indeed, the Myomorpha are remarkable for the unsatisfactory differentiation of the muscles composing the gluteal mass.

Obturator Internus, Externus, and Gemelli.—These muscles correspond to their descriptions in the other Rodents. The anterior gemellus is always better marked than the posterior one.

Quadratus Femoris.—There is usually a very slight tendon at the insertion, the muscle being triangular as in the Hystricomorpha and differing from the quadrilateral Sciuromorphine type; it is always large and distinct.

Biceps Femoris.—In *Myoxus*, *Mus barbarus*, and *Mus rattus* the two parts of which the biceps is composed are closely united and have one continuous insertion, as is the case in the Hystricomorphine Rodents. In the other Myomorpha the two parts are easily separable, as they are in *Sphingurus*[2]. When this happens, it is the upper part which rises from the anterior caudal vertebræ and is inserted into the outer side of the patella and ligamentum patellæ, while the lower part rises from the tuber ischii and is inserted into the fascia on the outer side of the leg. In certain cases, e. g. *Cricetomys* and *Myodes*, the upper portion is very closely connected to the gluteus maximus; while in *Cricetus* it is so closely blended with that muscle, that it has already been described as a part of the gluteus maximus which is inserted above the external condyle of the femur.

In *Georychus*, *Bathyergus*, *Rhizomys*, and *Heteromys* the two parts are separate from one another and from the gluteal.

[1] P. Z. S. 1894, p. 282.
[2] P. Z. S. 1894, p. 284.

Semitendinosus.—The normal arrangement seems to be, as in the other Rodents, that one head should rise from the posterior sacral and anterior caudal vertebræ, while the other comes from the tuber ischii. Either of these heads is often wanting. In *Georychus*, *Bathyergus*, and *Mus barbarus* the head from the tuberosity alone was found, while in *Microtus* and *Heteromys* only the spinal head was present. With regard to the arrangement in *Mus barbarus*, it is interesting to note that *Mus rattus* has both heads. The insertion in all cases is the same as that described in the other Rodents.

Semimembranosus.—The two parts of this muscle are always present, and correspond to the description already given in other Rodents. The semimembranosus proper is quite constant, always rising from the tuber ischii and being inserted into the back of the internal tuberosity of the tibia. The supracondylar slip, as in the Hystricomorpha, is variable both in size and in origin; its insertion, however, above the internal condyle of the femur is quite constant. In *Gerbillus*, *Mus barbarus*, and *Mus rattus* the supra-condylar portion rises from the anterior caudal vertebræ. In *Cricetus* it is small and comes from the caudal vertebræ and the tuber. In the other animals examined it rises from the tuber ischii only in common with the rest of the semimembranosus except in the case of *Bathyergus*, where its origin is more in common with that of the semitendinosus from the tuber. This supra-condylar slip is largest in *Georychus*, where it is greater than the rest of the muscle; in *Bathyergus* it is not so large; in *Rhizomys* it is only half the size of the rest of the muscle; while in *Cricetus* it is quite small. In *Hydromys*, Windle says [1] that the semimembranosus is inserted into the condyle of the femur alone, that is to say, the main part of the muscle is wanting. His dissection must of course be repeated, to see whether he had chanced upon an individual variation or whether this arrangement is constant in *Hydromys*. The nerve-supply of the two parts of the semimembranosus is as in other Rodents.

Gracilis.—This muscle is usually double and the two parts have approximately the attachments described in the Hystricomorphine Rodents; the anterior muscle usually overlaps the posterior a good deal. In *Myoxus*, *Rhizomys*, and *Heteromys* no separation was seen. In *Georychus* and *Bathyergus* the separation was very marked, there being quite an interval near the insertion. In *Myodes* the interval is greatest at the origin. *Hydromys* according to Windle agrees with *Myoxus* and *Rhizomys*.

Pectineus.—This muscle corresponds to the account of it in the other Rodents. In *Gerbillus*, *Cricetus*, *Myoxus*, and *Rhizomys* the muscle is double, but I am inclined to regard the inner part as belonging to the adductor mass, possibly representing the adductor longus.

Quadriceps Extensor.—In all the animals dissected, the two heads of the rectus could be made out, though in *Rhizomys*, *Georychus*,

[1] P.Z.S. 1887, p. 57

and *Bathyergus* the straight head was reduced to a minimum; the reflected head has usually some fleshy fibres rising directly from it. With regard to the other muscles the vastus externus is large and separate, while the internus is small and closely blended with the crureus.

Adductors.—The adductor mass in the Myomorpha resembles in its complexity that of the Sciuromorpha, although one frequently finds attempts at the more simple arrangement of the Hystricomorpha by fusion or non-differentiation of contiguous parts. As in the other Rodents, the supracondylar slip has been described with the semimembranosus, to which it undoubtedly belongs. Perhaps the animal which shows the greatest differentiation is *Cricetomys*: in it the mass consists of the following parts:—(1) The most anterior portion from the ilio-pectineal line to the middle of the posterior border of the femur by a narrow flat tendon. (2) Deep to this is another bundle which has the same origin but comes from rather more of the symphysis and goes to the whole of the femur as low as the ligamentum patellæ. (3) Behind the last is a thin flat portion rising by tendon from the horizontal ramus and being inserted into the lower half of the femur. (4) Most posteriorly, there is a thick mass from the ramus and tuber ischii which is inserted into the whole length of the back of the femur from the insertion of the quadratus femoris to the internal condyle.

In *Cricetus* (1) and (2) are fused and (4) only goes to the upper half of the femur. In *Microtus* (1) and (2) are fused, as are also (3) and (4). In *Gerbillus*, *Mus barbarus*, and *Mus rattus* (3) was not identified, while (4) was only inserted into the upper half to two-thirds of the femur. *Rhizomys* closely resembles *Cricetomys*. In *Georychus* and *Bathyergus* (1) is inserted into the middle third of the femur behind the pectineus, while the other three parts are fused into one great mass, which in *Georychus* is inserted into the middle two-fourths of the back of the femur, while in *Bathyergus* it goes to the whole length of that bone. In *Hydromys*, according to Windle, the adductor magnus, which apparently corresponds to the part which I have described as (4), reaches as low as the head of the tibia [1].

Tibialis Anticus.—This muscle always has the human origin; it never rises from the femur as in some of the Hystricomorpha. In *Georychus* the tibia above the cnemial crest is flattened, and forms a triangle with the apex downward and the surface a little concave; from this the muscle rises. As a rule, the tendon divides slightly below to be inserted into the internal cuneiform and the base of the first metatarsal, the latter insertion being the smaller.

In *Microtus*, however, the tendon divides into two equal parts. In *Gerbillus*, *Mus barbarus*, *Mus rattus*, and *Myodes* the tendon does not divide at all, but goes entirely to the cuneiform. In *Heteromys* the division is well marked, but both parts are inserted into the cuneiform.

[1] P. Z. S. 1887, p. 58.

Extensor Longus Digitorum.—As in all other Rodents, this muscle rises by tendon from the front of the external condyle of the femur. In *Mus barbarus*, however, as in *Sphingurus* and *Dipus*, a few accessory fibres came from the head of the tibia. The insertion is into the second, third, fourth, and fifth toes except in *Mus barbarus*, where the slip to the little toe was wanting, and in *Gerbillus*, where there was in addition a feeble slip to the first toe.

Extensor Proprius Hallucis.—This is always present and has the normal insertion. Its exact origin varies a good deal, and apparently is of little importance from a classificatory point of view. In *Gerbillus*, *Myoxus*, *Mus barbarus*, *Georychus*, and *Bathyergus* it rises from the second quarter of the fibula; in *Cricetomys*, *Cricetus*, and *Mus rattus* from the third quarter; in *Rhizomys*, *Microtus*, and *Heteromys* from the middle two quarters.

Extensor Brevis Digitorum.—As a rule this muscle has two tendons, one for the second, the other for the third toe; this is the case in *Cricetomys*, *Cricetus*, *Gerbillus*, *Rhizomys*, *Microtus*, *Heteromys*, *Mus barbarus* and *M. rattus*. In *Georychus* the fourth toe has a slip as well. In *Myoxus* and *Bathyergus* I was interested to find a distinct but small tendon to the proximal phalanx of the first toe, these being the only Rodents in which I have ever seen the extensor brevis going to the equivalent of our great toe. In no Rodent, so far as I know, is there ever a tendon to the fifth toe.

Peroneus Longus.—This is always a constant muscle rising from the upper quarter of the fibula, and passing through a groove on the outer side of the external malleolus anterior to the other peroneal tendons. In no animal dissected does it call for any remark.

Peroneus Brevis.—This arises from the middle two quarters of the fibula and passes between the tendons of the peroneus quarti and quinti digiti behind the external malleolus; it then runs above the peroneal spine on the calcaneum, which is usually large, to the base of the fifth metatarsal. It is in many cases a powerful abductor of the little toe.

Peroneus Quarti Digiti.—This muscle is always present, and generally rises just above the fusion of the fibula with the tibia. It has the usual insertion.

Peroneus Quinti Digiti.—This is quite constant and rises just above the last.

Gastrocnemius.—The gastrocnemius differs in no respect from the description given of it in the other Rodents. The three Mole-rats *Rhizomys*, *Georychus*, and *Bathyergus* have no fabellæ developed in the origin of the muscle, while in every other animal examined one was present in each head.

Soleus.—The soleus rises from the back of the head of the fibula and joins the tendo Achillis just below the middle of the leg. In *Myoxus*, however, it rose from the middle of the fibula. The rope-like twisting of the tendo Achillis already referred to [1] is always evident.

[1] Author's paper, Journ. Anat. vol. xxviii. p. 414.

Plantaris.—This has the typical rodent arrangement, the only point of interest being the extent to which the muscular fibres of the flexor brevis digitorum are developed in the sole. In *Gerbillus* three little slips of muscle are alone seen in the intervals between the four tendens where they first separate. In *Microtus* the flexor brevis has no muscular fibres at all, while in *Myoxus* and *Myodes* there are very few. All the other animals examined had well-developed muscular bellies to the flexor brevis.

Popliteus.—The popliteus always rises from the external condyle, and is inserted into the upper part of the internal border of the tibia.

Flexor Longus Hallucis (*Flexor Fibularis*).—This is always a large muscle, rising from both the tibia and fibula and being inserted into the distal phalanges of all the toes.

Flexor Longus Digitorum (*Flexor Tibialis*).—Dobson[1] states that this muscle in the Myomorpha is always separate from the flexor fibularis tendon in the sole. I have, however, met with two remarkable exceptions to this generalization, viz. *Rhizomys* and *Heteromys*. In both of these animals the tendons unite in the sole exactly as they do in the Hystricomorpha. I should mention that this arrangement was present in both the right and left feet. In *Georychus* and *Bathyergus* the muscle is better developed than in most of the Myomorpha, and ends in a bone beneath the base of the first metatarsal which I am inclined to regard as a rudiment of a præhallux. In all the other animals examined the muscle ends chiefly in the fascia of the foot.

Tibialis Posticus.—This is always a small muscle and rises from the upper part of the posterior surface of the tibia below the attachment of the popliteus, and also very often from the back of the head of the fibula. As a rule it has a groove of its own behind the internal malleolus, but in *Myoxus* it shares the groove of the flexor fibularis. It is inserted into the under surface of the navicular, though in *Mus rattus* it goes chiefly to the plantar fascia.

Muscles of the Foot.

Lumbricales.—In *Georychus*, *Bathyergus*, *Rhizomys*, and *Heteromys* only three lumbricales are present. All the other animals dissected have four.

Accessorius.—This muscle is very ill-developed in the Myomorpha. The only animal in which I found it really well marked was in *Bathyergus*, although traces of it could be made out in *Mus rattus*.

Abductor Hallucis.—This is usually present and rises from the navicular in *Cricetomys*, *Rhizomys*, *Mus barbarus*, and *M. rattus*. In *Gerbillus*, *Cricetus*, *Microtus*, *Myoxus*, *Heteromys*, and *Georychus* it came from the internal cuneiform. In *Bathyergus* it was well-marked and rose from the sustenaculum tali of the calcaneum, its proximal part forming the calcaneo-scaphoid ligament.

[1] Journ. Anat. xvii. p. 142.

Adductor Indicis.—The adductor indicis was present in all the animals examined except *Bathyergus*, *Georychus*, and *Heteromys*; in the latter it was replaced by an adductor hallucis, which in the other specimens was wanting, although Windle describes it in *Hydromys*[1].

Prof. Cunningham has pointed out (Journ. of Anat. vol. xiii. p. 11) that the foot of *Bathyergus* is peculiar in the total absence of plantar adducting and dorsal abducting muscles. This statement, which also applies to *Georychus*, I am able to corroborate. The muscle which I have described as abductor hallucis corresponds to Prof. Cunningham's inner head of the flexor brevis hallucis, though in his specimen the origin of the muscle was not so far back as in mine. In no Rodent were any distinct dorsal interosseous muscles found.

Interossei.—There are two interossei, or flexores breves, to each toe inserted into the sesamoid bones beneath the metacarpophalangeal articulation.

Myological Characteristics of the various Families of Myomorpha.

The animals of which the muscles have been described furnish examples of four families of the Myomorpha, namely the *Myoxidæ*, *Muridæ*, *Spalacidæ*, and *Geomyidæ*. Unfortunately the first and last of these are each represented in my dissections by only one individual, and for this reason any generalizations must be made very tentatively. Still it seems worth while making an admittedly imperfect contribution in the hope that it may be added to and corrected whenever fresh material is available.

In the first place, taking *Myoxus dryas* as a type of the *Myoxidæ*, one notices that:—

1. The biceps cubiti is only inserted into the radius.
2. The coraco-brachialis is only represented by the second part.
3. The palmaris longus is absent.
4. The flexor sublimis digitorum is inserted into the fifth digit as well as into the second, third, and fourth.
5. The extensor minimi digiti is only inserted into the fifth digit.
6. The trapezius has the second and third parts fused.
7. The trachelo-mastoid is absent.
8. The rectus abdominis does not decussate at its origin with its fellow of the opposite side.
9. The gracilis is single.
10. The soleus rises from the middle of the fibula instead of from the head of that bone.
11. The tendon of the tibialis posticus lies in the same groove as the flexor fibularis instead of in one of its own.

In the *Geomyidæ*, of which *Heteromys longicaudatus* is the only representative dissected, the following points are of interest:—

1. The digastric approaches the hystricomorphine type.
2. The semitendinosus has only the caudal head present.

[1] P. Z. S. 1887, p. 58.

3. The gracilis is a single muscle.
4. The flexor tibialis joins the flexor fibularis in the sole.
5. There are only three lumbricales in the foot.
6. There is an adductor hallucis instead of an adductor indicis in the foot.

Whether the rectus abdominis decussated with its fellow of the opposite side, could not be determined owing to the large incision which had been made for evisceration before the specimen came into my hands.

The family of the *Muridæ* is represented by accounts of the dissection of nine animals, and I am only able to discover one muscular peculiarity which is common to them all and at the same time distinguishes them from other families,—this is the fact that the rectus abdominis always decussates with the muscle of the opposite side. When one considers what a large and heterogeneous family this is, and that many of the genera included in it are only placed there provisionally, one is not surprised to find that their musculature is not nearly so consistent as it was found to be in the different families of the Hystricomorpha.

To my mind the fact that the latter show definite muscular characteristics which are not found in the former, indicates that the hystricomorphine families consist of animals which are more nearly allied to one another than is the case in the Muridæ: in other words, that the classification of the Hystricomorpha is more successful than that of the Myomorpha.

While speaking of the Muridæ, it is worth noticing that *Cricetus* and *Cricetomys* are the only two of the Myomorpha examined which possess the first part of the coraco-brachialis or rotator humeri muscle. In many particulars, however, they differ from one another.

In the family of the *Spalacidæ* there are records of three animals, *Bathyergus*, *Georychus*, and *Rhizomys*. The following points of resemblance were noticed in this group:—

1. The temporals are large and meet in the middle line of the head.
2. The stylo-hyoid and stylo-glossus are closely blended in *Rhizomys*, while in *Georychus* the stylo-hyoid is absent or completely fused with the other muscle.
3. The pronator quadratus is very feeble.
4. The reflected head of the rectus is ill-marked.
5. The gastrocnemius has no fabellæ in its tendons of origin.
6. There are three lumbricales in the foot.

The following are points of difference between *Rhizomys* on the one hand and *Georychus* and *Bathyergus* on the other:—

1. In *Rhizomys* the digastric has a well-marked central tendon, in *Bathyergus* and *Georychus* there is only an intersection.
2. In *R.* the cleido-mastoid is overlapped by the first part of the trapezius; in *B.* and *G.* it is not.
3. In *B.* and *G.* the scalenus anticus is present. In *R.* it is absent, as it is in all other Myomorpha except *Gerbillus*.

4. In *B.* and *G.* the sterno-scapularis is present. In *R.* it is absent.

5. In *B.* and *G.* the teres major is inserted in front of the latissimus dorsi, in *R.* behind it.

6. The coraco-brachialis is absent in *G.*, small in my specimen of *B.*, absent in Milne-Edwards's specimen. In *R.* the second and third parts are well marked.

7. In *B.* and *G.* the extensor communis digitorum sends no slip to the fifth digit. In *R.* a slip to this digit is present.

8. There is no sesamoid bone in the tendon of the supinator brevis in *B.* and *G.* There is one in *R.*

9. The pair of interosseous muscles which should be inserted into the two sesamoid bones of the fifth digit of the hand are absent in *B.* and *G.* They are present in *R.*

10. The rectus abdominis does not decussate with its fellow of the opposite side in *B.* or *G.*, though it does so in *R.*

11. The gracilis is a single muscle in *R.* It is distinctly double in *B.* and *G.*

12. The flexor tibialis joins the flexor fibularis in the sole of *R.* The two tendons are separate in *B.* and G.

13. The adductor indicis pedis is absent in *G.* and *B.*, present in *R.*

It will thus be seen that, though there are six more or less unimportant points of resemblance between *Rhizomys* on the one hand and *Bathyergus* and *Georychus* on the other, there are 13 points of difference, some of which, such as nos. 3, 4, 10, 12, and 13, I regard as of great importance.

The study of these marked muscular differences in animals whose habits are so much alike, and whose external appearances are so similar, seems to point to one of two conclusions. Either the external appearances are acquired by the animals living under similar conditions while the muscles tell the true tale of their different ancestry, or else the differences in the muscles are of no value for classificatory purposes.

Against the latter conclusion the evidence of the myology of *Bathyergus* and *Georychus* tells strongly; these animals are so alike in their habits, in their osteology, and in their visceral anatomy, that no one doubts that they are closely related; they are also alike in their myology with one or two trifling exceptions. This, however, is only one instance of the close resemblance of the musculature in animals which are for other reasons regarded as akin; and I cannot help thinking that when several important differences occur in the muscles of two animals which otherwise seem closely related, the muscles are trustworthy guides, because, taken as a whole, they are less likely to adapt themselves quickly to changed conditions than are other structures.

With regard to the position of *Rhizomys*, the junction of the two long flexors in the sole has been regarded by Dobson as characteristic of the Hystricomorpha, though I have found it in other animals. As this characteristic is present in *Rhizomys*, it is worth

while noticing that in no other respect does it approach the Hystricomorpha; consequently I think that the study of the muscles bears out the suggestion of Winge[1] that *Rhizomys* is distinct from the Bathyerginæ, and that it should be placed among the Muridæ, which it resembles in the only common point which this family has—the decussation of the rectus.

Winge[1] also suggests that *Bathyergus* is closely allied to the Hystricidæ. The following points in its myology show a divergence from the myomorphine and an approach to the hystricomorphine arrangement:—

1. The scalenus anticus is present and rises from the basi-occipital.

2. The scapulo-clavicularis is present, as in all Hystricomorpha, while in no myomorphine rodent was it found.

These two points alone would not of course justify one in separating the Bathyerginæ from the Myomorpha, but they show an approach to the hystricomorphine type which is suggestive.

The Position of the Dipodidæ.

A review of the muscles of Rodents would be incomplete without considering whether they lend any assistance towards determining the vexed question of the position of the Jerboas. In my former contribution I described their muscles with those of the Hystricomorpha. Now that the muscles of the Myomorpha have been worked out, a comparison can be made between them.

In the following points the Dipodidæ resemble the Hystricomorpha:—

1. The large size of the anterior deep part of the masseter passing through the infraorbital foramen.

2. The presence of a scalenus anticus rising from the basi-occipital.

3. The presence of only one head of the biceps cubiti.

4. The non-decussation of the rectus abdominis at its origin with the muscle of the opposite side.

5. The union of the tendons of the flexor tibialis and fibularis in the sole.

The first point is only one of degree since the Myomorpha show a small piece of the masseter passing through the infraorbital foramen.

The second has been found in *Myoxus* among the Myomorpha, as well as in *Bathyergus* and *Georychus*, whose position is not quite certain.

The third point is certainly in favour of hystricomorphine tendencies, as I have not yet found any myomorphine rodent without two heads to the biceps cubiti.

The fourth point, the decussation of the rectus, is not always found in the Myomorpha, while it sometimes occurs, as in the Octodontidæ, among the Hystricomorpha.

[1] E Museo Lundii, 1888, p. 109.

The union of the tendons in the sole has been already alluded to as not being entirely confined to the Hystricomorpha.

In the following points the Dipodidæ resemble the Myomorpha:—

1. The sciuromorphine arrangement of the digastric.
2. The presence of a transverse mandibular muscle.
3. The absence of the scapulo-clavicularis.
4. The presence of the omo-hyoid.
5. The absence of the splenius colli.
6. The origin of the levator claviculæ (acromio-trachelian) from the atlas.

The first three of these are very important and constant points, the latter three are sometimes noted in the Hystricomorpha.

On the whole I think that the myological points in favour of myomorphine tendencies for the Dipodidæ are far stronger than those in favour of hystricomorphine.

General Summary of Muscles of Rodents.

In order to complete my paper I propose to give a series of lists of the different points in which the four suborders of Rodents differ from and resemble one another, though the following pages are only tentative, and liable to require rearrangement as further material is added They may, however, prove useful in directing the attention of future observers to the muscles deserving of special notice from a classificatory point of view, and they may also be of service in showing the muscles that are constant in Rodents nearly related, whatever their mode of life may be, and that may turn out to be equally constant in nearly related groups belonging to other orders.

In a former contribution[1] the differences between the Hystricomorpha and Sciuromorpha are summarized.

Differences between the Myomorpha and Hystricomorpha.

1. The part of the masseter which passes through the infra-orbital foramen is usually small in the Myomorpha, large in the Hystricomorpha.
2. The Myomorpha have the sciuromorphine arrangement of the digastric.
3. The transverse mandibular muscle is present in the Myomorpha, absent in the Hystricomorpha.
4. The omo-hyoid muscle is always present in the Myomorpha, and may be present or absent in the Hystricomorpha.
5. The acromio-trachelian (levator claviculæ) always rises from the arch of the atlas in the Myomorpha. In the Hystricomorpha it sometimes rises from the basioccipital.
6. The scalenus anticus is usually absent in the Myomorpha, usually present in the Hystricomorpha.

[1] P. Z. S. 1894, p. 294.

7. The claviculo-scapularis is absent in the Myomorpha, present in the Hystricomorpha.

8. In the Myomorpha the three parts of the deltoid lie close together. In the Hystricomorpha they are separated by distinct intervals.

9. The biceps cubiti has two heads in the Myomorpha. In the Hystricomorpha there may be one or two.

10. The Myomorpha seldom have the first part of the coracobrachialis, in the Hystricomorpha it is often present.

11. The splenius colli is never found in the Myomorpha, in the Hystricomorpha it is sometimes seen.

12. The two parts of the biceps femoris are usually distinct in the Hystricomorpha. In the Myomorpha they are seldom separable.

13. In the Myomorpha the flexor tibialis and flexor fibularis do not usually join in the sole. In the Hystricomorpha they are always united.

14. In the Myomorpha the accessorius is absent or very ill-developed. In the Hystricomorpha it is present and well marked.

Differences between the Myomorpha and the Sciuromorpha.

1. The three parts of the temporal muscle are more closely fused in the Myomorpha than in the Sciuromorpha.

2. A small part of the masseter passes through the infraorbital foramen in the Myomorpha. No part passes through in the Sciuromorpha.

3. The three parts of the deltoid are more closely fused in the Myomorpha than in the Sciuromorpha.

4. In the Myomorpha a rotator humeri is only found in the Cricetinæ. In the Sciuromorpha it is always present.

5. In the Myomorpha the flexor sublimis digitorum sends no slip to the fifth digit. In the Sciuromorpha this slip is present.

6. The supinator longus is absent in the Myomorpha, but is present in the Sciuromorpha except *Castor*[1].

7. The extensor longus digitorum always sends a tendon to the fifth digit in the Sciuromorpha; this tendon is often absent in the Myomorpha.

8. The rectus abdominis often decussates at its origin with its fellow in the Myomorpha. There is no decussation in the Sciuromorpha.

9. The quadratus femoris is triangular in the Myomorpha, quadrilateral in the Sciuromorpha.

10. The supracondylar slip of the semi-membranosus always rises from the tuber ischii and is closely connected to the adductors in the Sciuromorpha. In the Myomorpha it may rise from the tuber or caudal vertebræ and is distinct from the adductor mass.

[1] Macalister describes an exceedingly feeble supinator longus in the Beaver ('Morphology of Vertebrate Animals,' p. 289).

11. The gracilis is usually double in the Myomorpha, single in the Sciuromorpha.

12. The accessorius is usually absent in the Myomorpha, always present in the Sciuromorpha.

With a view to comparing the myology of the Lagomorpha with the other suborders, I dissected the muscles of a Hare and a Rabbit, but have refrained from enlarging this paper with a detailed description of these muscles because they have already been described by other authors.

Differences between the Myomorpha and the Lagomorpha.

1. In the Myomorpha the different parts of the temporal are closely connected. In the Lagomorpha the orbital part is large and much separated from the rest.

2. In the Myomorpha the anterior deep part of the masseter passes through the infraorbital foramen. In the Lagomorpha there is no anterior deep part.

3. The posterior belly of the digastric is well marked in the Myomorpha, in the Lagomorpha it is only present as a narrow tendon.

4. The transverse mandibular muscle is present in the Myomorpha, absent in the Lagomorpha.

5. The omo-hyoid is present in the Myomorpha, absent in the Lagomorpha.

6. The acromio-trachelian (levator claviculæ) rises from the arch of the atlas in the Myomorpha. In the Lagomorpha it rises from the basioccipital and bifurcates below, one part going to the metacromion, the other to the clavicle and deltoid.

7. The scalenus anticus is sometimes present in the Myomorpha but absent in the Lagomorpha.

8. The scapulo-clavicularis is absent in the Myomorpha, except the Bathyerginæ. It is present in the Lagomorpha.

9. The three parts of the deltoid are fused in the Myomorpha, separate in the Lagomorpha.

10. The biceps cubiti has two heads in the Myomorpha, one in the Lagomorpha.

11. Among the Myomorpha the rotator humeri is only present in the Cricetinæ. In the Lagomorpha it is present in both rabbit and hare.

12. The pronator quadratus is present in the Myomorpha, absent in the Lagomorpha.

13. The clavo-cucullaris part of the trapezius is generally present in the Myomorpha, absent in the Lagomorpha.

14. The splenius colli is absent in the Myomorpha, present in the Lagomorpha.

15. The rectus abdominis frequently decussates with its fellow of the opposite side in the Myomorpha. In the Lagomorpha there is no decussation and the lineæ transversæ are much better marked.

16. The gracilis is usually a double muscle in the Myomorpha, single in the Lagomorpha.

The distinctions above given are possibly more numerous than they would be if the opportunity of dissecting a Pika (*Lagomys*) had presented itself.

To merely point out the differences between the various suborders does not give a just idea of their muscular characteristics. It is necessary also to lay stress on the chief points in which one resembles another and differs from the rest.

In the first place the Myomorpha resemble the Hystricomorpha and differ from both the other suborders in the following points:—

1. A slip of the masseter passes through the infraorbital foramen.
2. The three parts of the temporal are more closely fused.
3. The rectus abdominis often decussates at its origin.
4. The gracilis is usually double.
5. The supracondylar slip of the semimembranosus often comes from the caudal vertebræ.

The Myomorpha resemble the Sciuromorpha and differ from the other two suborders in the following points:—

1. The sciuromorphine type of the digastric.
2. The presence of the transverse mandibular muscle.
3. The constant presence of the omo-hyoid.
4. The acromio-trachelian (levator claviculæ) always rising from the atlas.
5. The absence of the scalenus anticus in the Sciuromorpha and in the Myomorpha except the Bathyerginæ and *Gerbillus*.
6. The absence of the scapulo-clavicularis in both, with the exception of the Bathyerginæ.
7. The presence of the two heads to the biceps cubiti.
8. The presence of the clavo-cucullaris part of the trapezius.
9. The absence of the splenius colli.
10. The presence of ischial and caudal heads to the biceps femoris, the latter being often more or less blended with the gluteus maximus.
11. The fact that the flexor tibialis (flexor longus digitorum) does not join the flexor fibularis (flexor longus hallucis), except in *Rhizomys*, *Heteromys*, and partly in *Pteromys*.

I have been unable to find any point of importance in which the Myomorpha resemble the Lagomorpha and differ from the other two suborders.

The Hystricomorpha resemble the Lagomorpha and differ from the other two suborders in the following points:—

1. The presence of the scapulo-clavicularis.
2. The omo-hyoid is often absent in the Hystricomorpha, always in the Lagomorpha.

3. The absence of the transverse mandibular muscle.
4. The frequent origin of the acromio-trachelian (levator claviculæ) from the basioccipital.
5. The usual presence of only one head of the biceps cubiti.
6. The occasional presence of the splenius colli in the Hystricomorpha and its constant presence in the Lagomorpha.
7. The basioccipital origin of the scalenus anticus when that muscle is present.

The Sciuromorpha resemble the Lagomorpha and differ from the other two suborders in the following points:—
1. The rotator humeri portion of the coraco-brachialis is always present.
2. The supracondylar slip of the semimembranosus rises from the tuber ischii in both, but while it is closely connected to the adductor mass in the Sciuromorpha, it is separate from it and adherent to the rest of the semimembranosus in the Lagomorpha.

On looking through these lists one cannot help being struck by the frequency with which certain muscles, such as the omo-hyoid, the scapulo-clavicularis, the acromio-trachelian, the scalenus anticus, the splenius colli, the trachelo-mastoid, and the rectus abdominis, occur again and again. It is chiefly by various combinations of these muscles aided by a few others, such as the transverse-mandibular, masseter, digastric, biceps, coraco-brachialis, &c., that the affinities between animals belonging to the same group are marked; and it seems to me that one would be justified in saying that, in Rodents at all events, the muscles of the trunk and neck are the most valuable for classificatory purposes. It may be urged that all these muscles are liable to individual variation; and this of course is probably true, though I am inclined to think that individual variations are far less frequent in Rodents than in Man; still if five or six of these muscles are taken, the risk of more than one being abnormal must be very slight indeed. As an instance of this the case of the Jerboa might be cited. In all the Hystricomorpha examined a scapulo-clavicularis had been found, but in the Jerboa it was absent. At that time I looked upon the animal, with Dobson, as hystricomorphine, and I regarded the absence of the muscle as an individual variation; as the dissection proceeded I found other points which were different to anything seen in the Hystricomorpha; later on I was lucky enough to get two more Jerboas of different species to the first one, and in both of these the scapulo-clavicularis was wanting also. Without the confirmatory testimony of the other muscles, the absence of the scapulo-clavicularis would probably have been passed over as of little importance. If the long flexors of the foot are considered, it will be found that they are not so reliable as the muscle just quoted. Dobson says that these long flexors unite in the Hystricomorpha but not in the other suborders; I have found, however, three animals—*Rhizomys*, *Heteromys*, and *Pteromys*—which have no

other affinities with the Hystricomorpha, but in which the union took place.

Other facts which may perhaps be of interest to the systematist are borne out by the foregoing lists. It is quite evident that the myology of the Myomorpha resembles that of the Sciuromorpha much more closely than that of the Hystricomorpha. The Lagomorpha, on the other hand, in their myology are much more closely allied to the Hystricomorpha than to the Myomorpha or Sciuromorpha, and of the two latter are nearest the Sciuromorpha. These conclusions I believe are already recognized by systematists from a study of other parts than muscles; and the fact that myology bears out these conclusions is to my mind an important plea for the value of the study of muscles as a help to settling the position of animals.

The results of this and the preceding paper may be briefly summed up in the following propositions:—

1. That the Myomorpha and Sciuromorpha approach one another in their myology.
2. That the Hystricomorpha similarly approach the Lagomorpha.
3. That the Bathyerginæ in many respects resemble the Hystricomorpha.
4. That *Rhizomys* more closely resembles the Muridæ than the Bathyerginæ.
5. That the Dipodidæ are more nearly allied to the Myomorpha than to the Hystricomorpha.
6. That in Rodents certain muscles are valuable for classificatory purposes and, if several are taken, are not likely to mislead.
7. That the muscles of the trunk, neck, and shoulder-girdle are the most reliable.

5. Description of a new Species of Antelope from East Africa. By Oscar Neumann[1].

[Received January 1, 1896.]

Among the animals collected during my expedition to East and Central Africa, in 1892–95, there are examples of an Antelope from Uganda, Ussoga, and Kavirondo, belonging to the genus *Adenota*, Gray. This Antelope seemed to me to be different from *Adenota kob*, with which it had hitherto been united. Not having enough material of the true West-African *Adenota kob* in Berlin, I took two horns and one skin of this species with me to compare them in Paris with Buffon's type and also with specimens in London. In both places I found my opinion confirmed; I also found that both Mr. Thomas and M. de Poussarges had independently arrived at the same conclusion—thanks to additional material brought by Mr. Dècle from Uganda, and by Captain Lugard from the Niger. I propose to name this species, in honour of Mr. Thomas,

[1] Communicated by the Secretary.

ADENOTA THOMASI, sp. nov.

Colour nearly or quite the same as *Adenota kob*. Size larger. Skull and horns much larger than those of *A. kob*. The ridges of the horns much more rounded and less sharp than in *A. kob*. Colour of the horns basally light horn-yellow, gradually becoming darker at the points; while the horns of *A. kob* are nearly uniformly blackish.

Adenota vardoni, to which the horns of *A. thomasi* come nearest, although generally shorter, is distinguished by the total absence of black colour on the legs, while *A. leché* is distinguished by its far larger size and longer horns. Young specimens of *A. kob*, *A. thomasi*, *A. vardoni*, and *A. leché* may be difficult to distinguish.

Skull Measurements.

	Adenota thomasi.		*Adenota kob.*	
	a. Type, Scott Elliot. (Uganda.)	*b.* Lugard. (Unyoro.) 94.5.4.3 (younger).	*a.* Stevens. (W. Africa.) 885 *c.*	*b.* Lugard. (Niger-Benue Junction.)
	millim.	millim.	millim.	millim.
Greatest breadth.	131	121	112	115
Basal length.....	267	248	235	242

Horn Measurements.

	Length		Circumference.	Tip to tip.
	straight.	round curve.		
Adenota kob, Buffon.				
	millim.	millim.	millim.	millim.
a. W. Africa, B.M. (*Stevens*)	277	372	141	144
b. Niger-Benue Junction (*Lugard*)..	305	321	131	159
Adenota thomasi, O. Neum.				
a. Type B.M., Uganda (*Scott Elliot*)	369	464	178	267
b. Unyoro, B.M. (*Lugard*)	378	470	166	213
c. Uganda, B.M. (*Speke*)	375	458	190	251
d. Uganda, Berlin (*O. Neumann*) ...	410	512	178	153

Mr. Matschie, in his excellent book on the 'Mammals of German East Africa,' calls the Central-African form *Adenota kob* (p. 126), but in the appendix he calls it *Adenota koba*, Erxl. (p. 147).

I cannot believe that Buffon's "Koba ou la grande vache du Sénégal" was an *Adenota* at all, and if it was one, it rather seems to me that Buffon had had two skulls of the same species, and that he figured the adult specimen as "*koba*" and the young one as "*kob*." For he affirms that both came from the Senegal.

Adenota thomasi is known from the northern Central-African Lake region:—Kavirondo, Ussoga, Uganda (*Speke*, *Jackson*, *Gedge*, *Lugard*, *Stuhlmann*, *Neumann*); Unyoro, Albert Lake (*Lugard*); Simiu River—south-east corner of the Victoria Nyanza (*Langheld*). Unyoro is the most northern known point. It does not occur east of the watershed to the Victoria Nyanza (Mau Sotik mountains). North of Unyoro is the region of *Adenota mariæ*, Gray, and *A. leucotis*, Licht. (Bahr el Gazal, Sobat, Kir). To the west the true *A. kob* occurs—Senegal and Gambia (B.M. Type Paris Mus.), Togo (*Baumann*), Cameroons (*Zenker*), extending eastward to the Ubangi river, whence Dybowsky brought specimens to Paris.

Southward occur *A. leché* and *A. vardoni*, which are both known from British Central Africa (Lakes Mwero, Bangweolo, Nyassa, south Tanganyika). It seems that the two species of *Adenota* met with by Böhm and Reichard west of Tanganyika must have belonged to these last two species.

A. thomasi lives in herds of 30–50, about five times as many females as males; its habits are those of *Æpyceros melampus*, but it prefers rather damp meadows near the water. Kiganda name: *Nssunu*.

I shall on a future occasion give a more exact comparison of the six species forming the genus *Adenota*.

6. On some Earthworms from the Sandwich Islands collected by Mr. R. L. Perkins; with an Appendix on some new Species of *Perichæta*, &c. By Frank E. Beddard, F.R.S., &c.

[Received December 16, 1895.]

So little has been done in exploring the Earthworm-fauna of oceanic islands that I am particularly pleased at being able to offer to the Society an account of a rather extensive collection of Earthworms made in the Sandwich Islands by Mr. R. L. Perkins under the auspices of the British Association Committee for the exploration of those islands. Two collections made at different times and kindly forwarded to me by Dr. D. Sharp, F.R.S., include examples of a number of species principally belonging

to the genus *Perichæta*. I am much indebted to Dr. Sharp, and also to Mr. Perkins for his careful preservation of the specimens.

Our knowledge of the Earthworms of the Hawaiian Archipelago is at the present time exceedingly limited: four species form the entire list; and of these *Perichæta corticis* of Kinberg[1], though undoubtedly a *Perichæta*, or at least a Perichætid, is quite unrecognizable as a species, while *Hypogæon havaicum* of the same naturalist is believed by Rosa[2] to be merely *Allolobophora putris*, a widely spread species which has been "introduced" into many extra-European countries. Two species, however, which have been sufficiently described for identification, appear to be peculiar to the Sandwich Islands. The first of these was made known by Dr. Rosa[3], and fully described from material existing in the Vienna Museum, as *Perichæta hawayana*. The second, which is not perhaps so certainly a distinct species, I have myself described under the name of *Pontoscolex hawaiensis* in my recently published 'Monograph of the Order Oligochæta' (p. 660).

In the present communication I have three new Hawaiian species to add to this list; and I have also to record the occurrence in those islands of a few widely distributed forms. The entire list of Earthworms now known from the Hawaiian Archipelago, excluding only the unintelligible *Perichæta corticis*, is as follows—the species peculiar to the islands being printed in Clarendon type:—

Fam. Lumbricidæ.

(1) *Allolobophora fœtida.*
(2) *Allolobophora putris.*
(3) *Allolobophora caliginosa.*

Fam. Perichætidæ.

(4) *Perichæta indica.*
(5) **Perichæta hawayana.**
(6) **Perichæta perkinsi.**
(7) **Perichæta molokaiensis.**
(8) **Perichæta sandvicensis.**

Fam. Geoscolicidæ.

(9) **Pontoscolex hawaiensis.**

This will appear to many to be a meagre enough list, especially when contrasted with the rich and peculiar insect, molluscan, and avian fauna of the same islands. But it is a long list when compared with those of the Earthworms of other oceanic islands, from very few of which have undoubtedly indigenous forms been secured.

[1] "Annulata nova," Öfv. K. Svensk. Vet.-Akad. 1866.
[2] "Revisione dei Lumbrici," Mem. Acc. Torino, 1893.
[3] Ann. d. k. k. Hofmus. Wien, Bd. vi.

It is early, of course, to lay down any general statements; and were it not that Mr. Perkins has collected so many species and in most cases so many individuals of each species, I should have contented myself with a plain description of fact and should not have ventured upon comment. It may be permissible, however, to indicate the "Oriental" facies of the fauna and the absence of very peculiar types. The latter statement, in fact, appears to hold good generally for oceanic islands, so far as our imperfect data enable us to speak. It argues their really oceanic origin and their short existence. Even in Kerguelen and Marion Is., which are remote from traffic and can hardly have been stocked by human means, the one known species, *Acanthodrilus kerguelarum*, is only specifically different from the Earthworms most nearly allied upon the adjoining mainlands. And these islands are possibly among the most ancient of oceanic islands.

Allolobophora fœtida, Sav.

Numerous examples of this widely distributed species from Halemanu, Kausi.

Allolobophora caliginosa, Sav.

Hab. Waialua, Oahu.

Allolobophora putris, Sav.

There are a large number of examples of the variety "*arborea*" (smaller, and with tubercula pubertalis only upon xxix.& xxx.), which Rosa believes to be identical with Kinberg's "*Hypogæon havaicus*." Its occurrence, therefore, is not a new fact.

Hab. Molokai, and Kawailoa River, Oahu.

Pontoscolex hawaiensis, n. sp.

Of this apparently new species some 8 or 10 examples were collected.

The length of a fair sized specimen is 142 mm; the breadth at the clitellum 4 mm., elsewhere rather less. The number of segments is rather more than 210; after the 128th segment is an oval swelling upon the body 3 mm. long and commencing about 90 mm. from the anterior end; this is the structure which has been described in other species, and regarded as a growing point. This modified region of the body appears to be constant in position; this is shown by the following measurements of two individuals:—

	A.	B.
Length of body in front of "growing region"	90	80
Length of body behind "growing region".....	47	40

The intestine proper appears to begin at the end of the clitellum; there is here a distinct circular valve, and the intestine has a distinct typhlosole projecting into its lumen. The calibre, however, is not greater.

The setæ of this species are, as in *Rhinodrilus*, ornamented

throughout. On the very first seta-bearing segment of the body the setæ have precisely the same ridged free extremities that the setæ upon the clitellum show. At first the setæ of each pair are fairly close together. Later they get farther apart and become irregular in arrangement, as in *Pontoscolex corethrurus*. On the clitellum the ventral pairs are quite regular, although each individual seta of the pair is farther away from its fellow than anteriorly. This continues for a short distance behind the clitellum. On the other hand, the lateral pairs of setæ are irregular in the clitellar region. The ventral of the two setæ, however, which is on a line with the nephridiopore, is fixed in position: it is the other which varies.

The clitellum occupies segments xiv.–xxi. with a portion of xiii. and xxii.

The dorsal vessel is in certain respects peculiar[1]. Where it emerges from the last thick mesentery it is moderately thin; it gradually becomes thicker and at the same time moniliform; the increased thickness is due to the fact that the dorsal vessel becomes double; its character is that of the dorsal vessel in *Acanthodrilus novæ-zelandiæ*, *i. e.* the tube is single where it traverses the septa, but separates into two halves between the septa. In segments xiv. and xv. the dorsal vessel attains to its greatest bulk; after this its calibre becomes suddenly diminished. It retains, however, its double character.

In segments xi., xii. are hearts which seem to have no connection with th › dorsal vessel but only with the supra-intestinal.

The gizzard is in segment v.; it is followed by four very thick septa. In the segments following the gizzard are 3 pairs of calciferous glands. Behind the first three strong septa are very small spermatothecæ, simple elongate oval pouches without diverticula.

Hab. Mauna Loa, Hawaii, and Waiahia, Oahu.

Perichæta indica, Horst.

Dr. Michaelsen has called attention[2] to the fact that this species, which is very widely distributed, is frequently without a "prostate" gland. In five specimens which he received from Georgia and Florida there was no trace of the gland, only the muscular duct being present. In the 6th specimen the gland was present on one side. Dr. Michaelsen further makes the suggestion that the original home of the species may be Japan, where as a general rule[3] the *Perichætæ* show the same character.

Among the worms collected by Mr. Perkins were 8 examples of this species from Molokai, all fully mature; I dissected seven of them, in none of which was there the least trace of the gland in question; the curved duct alone was present.

[1] In one specimen of three which I examined, the dorsal vessel seemed to be single.

[2] "Die Regenwurm-Fauna von Florida u. Georgia," Zool. JB., Bd. viii. p. 177.

[3] F. E. Beddard "On some Perichætidæ from Japan," ibid. Bd. vi. p. 755.

Dr. Michaelsen has also called attention to the variability of the genital papillæ.

Of my specimens four are normal (*i. e.* there are 3 pairs on vii., viii., ix.); in two the papillæ are on vii., viii. on one side of the body, on viii. only on the other; in the seventh specimen these conditions are exactly reversed; in the eighth, one side of the body is normal, on the other the papillæ lie on viii., ix., x.

In six specimens from Maui[1] the genital papillæ and prostates were as follows:—

1....	On vii., viii.	0.
2....	0.	Small.
3....	viii., ix.	0.
4....	On viii. (left side only).	Small (on one side only, left).
5....	0.	0.
6....	vii., viii.	Small (on one side only, left).

It is interesting to contrast this list with the last, on the hypothesis, of course, that the islands upon which the two series were collected are different.

There were also two individuals from Mauna Loa, Hawaii, upon which I do not comment, as there were only two.

Perichæta perkinsi, n. sp.

The length of this species (of which I have examined two examples) is 192 mm.; the diameter is 6 mm. The number of segments is 110.

The *colour* is of a light brown, darker on the back.

The *prostomium* is broad (2·5 mm.) but not long; it is cut off from the first segment by a transverse groove.

The buccal cavity is eversible, as in many *Perichætæ*.

The first *dorsal pore* that I could detect lies between segments xii./xiii.

The *clitellum* occupies the whole of segments xiv.–xvi., and is without setæ.

The *oviducal pore*, distinctly a single pore, is situated in the middle of a white area upon the brown clitellum on segment xiv.

The *male pores* are rather wide apart, and upon segment xviii. I counted eleven setæ between them. Each pore itself is upon a whitish papilla, and to the outside is another smaller papilla which is not perforated; the two are surrounded by several concentric circular wrinkles of the integument.

There are no *genital papillæ* except the one just referred to and upon which open glands.

The *setæ* of *P. perkinsi* are not so numerous as in many other species. The segments in the anterior part of the body have fewer setæ than those which follow. There is a gradual increase up to the xviith segment, whence the number appears to remain fairly

[1] Mr. Perkins has queried the locality.

constant up to the end of the body. The formula[1] will read thus:—

Segment	I.	V.	XII.	XVI.
No. of setæ	23	31	43	46

but on some segments quite close to the tail I counted as many as 49 setæ. The size of the setæ varies on different segments and on different parts of the same segment. The setæ on either side of the nerve-cord, as is the case with other species (e. g. *Perichæta houlleti*), are larger than those more laterally placed. This difference commences to be well marked in the third setigerous segment, anterior to which, it may be observed, is no ventral nerve-cord, but the circumœsophageal commissures. From the third setigerous segment to the sixth (inclusive) there is this marked difference between a few ventral setæ—particularly the ventral-most seta—on either side of the nerve-cord and the rest of the setæ of the segment. On the tenth segment all the setæ are very much smaller than on the preceding segments[2], and those on either side of the ventral nerve-cord are not larger. On the eleventh segment the setæ again are larger, and there is a slight difference in size between the ventralmost two or three setæ and the rest, but not nearly so marked as on segments iv.–vii.

The clitellum is, as has been already mentioned, entirely witnout setæ; but no doubt in the immature worm they are present. In any case the special longitudinal muscles of the setæ were quite obvious in the mature worm. At the hinder end of the body the setæ are larger than those of some of the anterior segments—a difference which may have to do with the habit (so general among earthworms, at least of this country) of lying outside the burrow with the tail only concealed within.

The first *septum* lies between segments v./vi. The septum between viii./ix. is missing, as is nearly universally the case with *Perichæta*. The septum between ix./x. is largely defective, though not absent; it consists chiefly of a strong muscular band on each side, which is attached to the insertion of the next following septum. Septa v./viii., x./xiii. are moderately thickened.

In the hinder part of the body were paired masses of cœlomic cells, attached on either side of the dorsal blood-vessel, such as I have described in *Perichæta*. They were full of Gregarines.

The *pharynx* is beset with numerous salivary glands, which extend back as far as the sixth segment. The gizzard is globular, not in any way elongated.

The last *heart* is in segment xiii.

The *sperm-sacs* are in segments xi., xii.; there are, as usual, two pairs of sperm-duct funnels.

[1] This is a little different from the segments originally selected ("On some Species of the Genus *Perichæta*," P. Z. S. 1892, p. 157); but as the number culminates at xvi. I have thought it well to emphasize the fact by the formula.

[2] In relation to this fact, it is interesting to observe that in *Perichæta caducichæta* (Benham, Ann. & Mag. Nat. Hist. ser. 6, xvi. p. 47, 1895) the setæ upon this segment are absent.

The *spermiducal glands* extend through three segments; they are coarsely lobate, and the muscular duct is curved like a horse-shoe; there is no terminal sac.

The *ovaries* are in segment xiii., and in the same segment are a pair of rather large kidney-shaped egg-sacs.

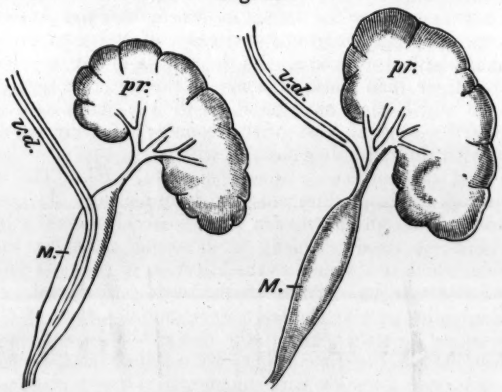
The *spermathecæ* are four pairs in segments vi.–ix. The pouch, which is pear-shaped, is sharply marked off from the narrow duct. The diverticulum is rather longer than the latter, and ends in an oval dilatation.

Locality. Halemanu, Kauai.

Remarks.—This species does not possess any very marked distinctive characters, excepting, perhaps, one which will be described immediately. On the other hand, I cannot identify it with certainty with any of the species already known that have four pairs of spermathecæ.

I may take this opportunity of recording a peculiarity in the sperm-ducts of *Perichæta perkinsi*, which is new to the genus, and does not therefore help in the identification of this species; indeed, so few species of *Perichæta* have been examined microscopically, that the absence of the peculiar relations of the sperm-duct to the spermiducal gland, which I am about to describe, in the species

Fig. 1.



Perichæta perkinsi.

Spermiducal gland (*pr.*), vasa deferentia (*v.d.*), and muscular duct (*M.*) of gland of *Perichæta perkinsi* (left-hand figure) and of a normal *Perichæta* (right-hand figure).

already investigated, does not go for much. The two sperm-ducts retain their separateness, and perforate the duct of the spermiducal gland at some little distance from its external opening, but at a point where it is already wrapped up in a moderately thick coating of muscular fibres, not so thick, however, as they will ultimately become. The two sperm-ducts, however, do not at

once open into the lumen of the duct; they become narrower and somewhat triangular in section, losing at the same time their ciliated lining. In cross-sections the two tubes are seen to lie in close contact with each other and with the lumen of the spermiducal-gland duct. Ultimately, just where the gland-duct perforates the body-wall on its way to the exterior, the sperm-ducts open into it.

Perichæta molokaiensis, n. sp.

This is a moderately small species, 81 mm. in length, and consisting of 93 segments.

The *prostomium* is small, and is continued by grooves on to first half of first segment.

The *dorsal pores* commence on x./xi., and are visible upon the clitellum.

The *clitellum* has a few setæ on its last segment, and extends over segments xiv.–xvi.

There are no *genital papillæ*.

The *male pores* are separated by 15 setæ.

The first *septum* separates segments iv./v.; none are specially thickened.

The *intestine* begins in xv.; the cæca are in xxvi., and are not large.

The *sperm-sacs* are large, and are in xi., xii.; the sperm-reservoirs (containing the funnels) in x., xi.

The *spermiducal glands* extend from xvii.–xxi., and are much lobed. Their duct is long and curved, but has no terminal sac.

The *spermathecæ* are four pairs in vi.–ix. The pouch is sharply marked off from the long duct. The diverticulum, ending in an oval dilatation, is about as long as the latter.

Hab. Molokai.

Remarks.—As I have only had a single specimen of this species at my disposal, I have been careful to injure it as little as possible. Hence my description is in places somewhat defective. I believe, however, that this description is sufficient to avoid a confusion with allied forms. It is certainly not far from *Perichæta peregrina* of Fletcher[1], chiefly in the large size of its spermiducal glands. Mr. Fletcher does not say how many of the clitellar segments of *P. peregrina* have setæ, a matter which is apparently of some importance in the discrimination of species.

Perichæta hawayana, Rosa.

The length of the largest example of this species in 150 mm.; the number of segments of that individual was 97.

The *colour* is brown, with a pure flesh-tinge in parts.

The *seta*-formula is as follows:—

I.	V.	XII.	XVI.	XXI.
16	26	43	45	50

[1] Proc. Linn. Soc. N. S. W. 1886, p. 969.

There are nine setæ on the xvith segment of the body, 4 on one side and 5 [1] on the other side of the median ventral line. On the third, fourth, and fifth setigerous segments the setæ are very stout, particularly on either side of the median ventral line. Those of the first two segments are delicate, as are those which follow the fifth. Fourteen setæ lie between the male pores.

The *clitellum* (xiv.–xvi.), as has been already remarked, has setæ upon its last segment.

The *dorsal pores* commence x./xi.

The *male pores* lie in the line of setæ; close to each, but below the line of setæ, are two or three *papillæ* in a straight line with their fellows on each side of the body, but obliquely as regards its transverse axis.

The first *septum* divides segments v. and vi.; this and the next two are thickened; so are the first four following the gizzard, the last of which divides segments xiii./xiv.

The *intestine* begins in xv.; the cæca, which lie in segment xxvi., are short.

The last *heart* is in segment xiii.

The *sperm-sacs* lie in xi. and xii.; in x. and xi. are the sperm-reservoirs, containing funnels of sperm-ducts.

The *spermiducal gland* occupies segments xvii.–xxi.; it is flattened and lobulated; the duct is long and curved, narrowing towards the external orifice, which is not provided with a terminal sac.

The *ovaries* occupy the usual position. There are a pair of elongated egg-sacs in both xiii. and xiv.

The *spermathecæ* are in vi., vii., viii. The oval pouch communicates with the exterior by a long duct longer than itself. The diverticulum, ending in an oval dilatation, has a corkscrew-like duct. This diverticulum, when straightened, is not far short of the pouch in length.

Hab. Waimea, Molokai, and Mauna Loa, Hawaii.

Remarks.—I have given a description of this species because the individuals examined by myself depart slightly and in a few particulars from the description given of *Perichæta hawayana* by Dr. Rosa. The most noteworthy difference is apparently the existence of setæ upon the last segment of the clitellum. Dr. Rosa does not assert their absence, but would, I am disposed to think, have mentioned their presence were they existent. On the other hand, his description of the intestinal cæca—"eine gefiederte, durch zwei Lappenreihen vermittelte Gestalt erkennen lassen"—agrees entirely with my observations. Differences also in the number of the setæ in certain segments, and in the number of the thickened intersegmental septa, will appear on a comparison of Dr. Rosa's account with mine.

I have marked this species as one of those indigenous to Hawaii.

[1] 14 or 15 altogether in another specimen, and more still apparently in others.

But I possess specimens from Hong Kong which cannot be distinguished. One of these has four papillæ near the male pore of one side of the body. It therefore approaches *Perichæta bermudensis*, which has a considerable number of such papillæ. These two species are now hardly to be separated.

Perichæta sandvicensis, n. sp.

The largest example of this species measures 100 mm. in length, and has 105 segments.

The *dorsal pores* commence xi./xii., and are visible on the clitellum.

The *seta*-formula is the following:—

I.	V.	XII.	XVI.
21	33	52	53

The setæ of the first two segments are small; those of the next four are stronger, after which they again diminish. The setæ on either side of the median ventral line are not longer than those elsewhere.

The *clitellum* occupies segments xiv.–xvi., and has no setæ.

The *male pores* are separated by 18 setæ. They were in most of the specimens very prominent.

There are *no genital papillæ*.

The first *septum* divides segments v./vi.; this and the one which follows are very stout, and bound to each other by numerous muscular threads. The septum vii./viii. is not so thick. The next two, as in other *Perichætæ*, are absent. After the gizzard are two strongest septæ; to the first of these the hinder part of the gizzard is attached by at least five muscular straps.

The *alimentary canal* presents no character of any particular interest.

The last *heart* is in segment xiii.

The *sperm-sacs* are in segments xi. and xii. The sperm-reservoirs of segment xi. are much larger than those of segment x.

The *spermiducal glands* are much incised, and occupy about three segments. The duct is long and curved, and is without a terminal sac.

The *spermathecæ* are two pairs in vii. and viii. The pouch has not a very long duct. The diverticulum is not very long; it is bent often in a zigzag fashion, and does not terminate in a suddenly dilated extremity.

Hab. Lanai, 2000 ft.; Mauna Loa, Hawai, Molokai.

Remarks.—The only species with which it would be possible to confuse the present are *Perichæta annulata* and *Perichæta japonica*. In the latter, however, the male pores are described by Horst[1] as lying upon a J-shaped groove, which extends on to segment xvii. In the former, according to the same author, the

[1] "New Species of the Genus *Megascolex*, &c," Notes Leyd. Mus vol. v. p. 182.

"prostate" glands, although trilobed, are limited to the xviiith segment.

The shape of this gland is frequently used as a specific character in *Perichæta*, and as a rule apparently with some reason. The present species, however, shows that it is necessary to be discreet in the use of the character. In nearly all the examples which I dissected, the gland in question occupies three or four segments and has an ear-like shape, the lower margin curving forwards and upwards like the lobe of the ear. In one specimen, which I do not feel able to distinguish specifically, the gland has a quadrangular form, occupies four segments, and is deeply incised in correspondence therewith.

From Hong Kong I have received specimens of a *Perichæta* which I do not like to separate specifically from the above, although they show certain differences from it amongst themselves. In one specimen, a long and slender worm, the spermathecæ have a long duct, and the spermiducal glands have the ear-like shape characteristic of the species. The male apertures are prominent. Other specimens, though smaller, are rather stouter worms than the one just referred to; the duct of the spermatheca is not very long, and the spermiducal glands are much lobulated and not ear-shaped. Nor is there here a marked difference between the septum immediately preceding the gizzard and those just in front of it: there is this difference in the first mentioned specimen from Hong Kong. In both the cæca are long and slender, occupying two full segments.

Appendix.

I take the present opportunity of describing three new species of *Perichæta*, and two new *Acanthodrilids*, which I have recently received.

Perichæta insulæ, n. sp.

Of this new species I have a single example—a slender worm measuring 103 mm.

It consists of 95 segments.

The *clitellum* occupies the three usual segments, but is deficient at both ends. The last segment of the clitellum has setæ.

The *male pores* are separated by a moderate distance.

Genital papillæ are present in two regions of the body. On the xviiith segment are 8 largish papillæ, each surrounded by a series of circular ridges upon the skin. Two of these papillæ form on each side with the male pore of their side a triangle; the remaining four form a line across the segment above the line of the setæ. On segment xix., on the left side of the body, is a single similar papilla. In addition to these papillæ developed in the neighbourhood of the male pores, there are a pair near the anterior margin of the viith segment like those of *Perichæta indica*.

The first *septum* separates segments iv./v. This and the three following are not very much thickened, but they are tied to each

other and to the parietes by a considerable number of ligamentous threads. The three septa which come immediately after the gizzard are stouter than those which follow; but here, again, the increase in thickness is not very marked.

Fig. 2.

Perichæta insulæ.

♀, oviducal pore. ♂, male pore.
p, papillæ.

The *pharynx*, as is so usual in *Perichæta*, is beset with numerous racemose glands; these extend back as far as the sixth segment. The *gizzard* is rather bell-shaped, diminishing in transverse diameter anteriorly, but truncated posteriorly, where it has a thickened rim. The intestine begins abruptly in the xvth segment at about the middle of that segment. The cæca extend through two segments. The last heart is in segment xiii.

The *sperm-sacs*, compact in form, are in segments xi., xii. as usual. The *spermiducal glands*, also rather compact, commence in xvii. and extend as far back as xx. The duct is stout and S-shaped.

The *spermathecæ* are in vi., vii. Each has a diverticulum about half its own length, of an elongated oval form.

Hab. Hong Kong.

PERICHÆTA TRITYPHLA, n. sp.

The *length* of this species (after preservation in Perenyi's fluid) is 63 mm.; that individual consisted of about 75 *segments*.

The *seta-formula* is as follows:—

I.	VI.	XII.	XVII.
25	38	49	49

I give segment vi. instead of v. since I did not count the setæ with accuracy upon the latter. The setæ towards the ventral side are slightly more crowded than laterally, but there is no very marked difference in size; neither is there any very great variation in size from segment to segment.

The *clitellum* occupies the whole of segments xiv.–xvi.; it has no setæ.

The *male pores* are separated by 12 setæ.

There are *no genital papillæ*.

Between the spermathecal orifices are 30 setæ.

There are no *septa* that can be spoken of as specially thickened.

The *gizzard* seemed to me—contrary to what is the rule with the genus—to only occupy a single segment. At any rate, on the right-hand side of the body a septum passes forwards from the hinder margin of the gizzard, to be attached close to the orifice of the second spermatheca of that side of the body. The intestine, commencing in the fifteenth segment, is very sharply marked off from the preceding œsophagus by its black colour (due of course to contained earth), the œsophagus being yellowish white. The intestinal cæca are peculiar and serve to differentiate the species. It is well known that *Perichæta hilgendorfi*, *P. sieboldi*, and *P. musica* possess as a rule, or occasionally, 6 of these cæca on each side of the body, arising, however, one above the other in the same segment. The present species is not so amply provided as are those to which I have just referred; but it has three cæca on each side, of which the upper is the larger.

The last *heart* is in segment xiii.

The *sperm-sacs* are large and occupy the available space of segments xi., xii.; they also extend into x. The sperm-reservoirs (in x., xi.) are small.

The *spermiducal glands* extend through segments xvii.–xxi. They are much incised and quadrangular in form. The duct communicates with the exterior through a large *bursa copulatrix*.

The globular *spermathecæ* are in vii. and viii.; they open, however, between vii./viii. and viii./ix.; their duct is short; there is a long coiled diverticulum rather longer than the pouch, ending in a dilated extremity.

Hab. Barbados.

PERICHÆTA TRINITATIS, n. sp.

This is a stout *Perichæta* measuring 150 mm. in length and consisting of 100 segments.

The *setæ* upon segments vi.–ix. appeared to be larger than those on the segments following. On the seventeenth segment (from the stripped-off cuticle) I counted 45 setæ. There are 20 between the male pores.

The *dorsal pores* appeared to commence on xi./xii.

The *clitellum* occupies segments xiv.–xvi.

The *male pores* are very conspicuous and surrounded by circular wrinkles of the integument.

There are no *genital papillæ*.

The first distinct *septum* separates segment iv. from v. This and the three following—in fact all the septa which lie in front of the gizzard—are strengthened not only by an increased thickness, but by muscular strands which bind septum to septum and to the body-wall. Following the gizzard are four thickened septa, of which the last bounds the thirteenth segment posteriorly; here also are a few muscular threads passing between the septa and from them to the body-walls. These threads are found as far back as the septum lying between xv. and xvi. As is so often the case, these bands arise from one segment and traverse another to be attached to the septum behind it or to the body-wall between. The direction of the muscular strands is outwards. Two particularly strong muscular bands—one on either side and latero-dorsal in position—attach the gizzard to the septum next following.

The *gizzard* is round in form—neither particularly elongated nor bell-shaped.

The *intestine* begins suddenly in the xvth segment; the cæca are simple and conical in form, extending through three segments.

The last *heart* is in segment xiii.

The large *sperm-sacs* are as usual in the xith and xiith segments.

The *spermiducal glands* are large and loosish in texture, owing to their extensive lobulation. They extend through segments xvii. to xxi. inclusive. The duct is moderately long and bent into a curved horseshoe.

The *spermathecæ* are four pairs lying in segments vi.–ix.; the point itself is oval, with a tendency to be pointed at the tip; the duct is short. The diverticulum is longer than the pouch and moniliform distally.

There are egg-sacs in segments xiii.–xiv.

Hab. Trinidad.

§ *The Distribution of* Perichæta.

Except for accidental transference to this country and to other temperate climates, the genus *Perichæta* is purely tropical in its range, and is practically confined to the Oriental region and to the Neotropical; from the former it reaches the Australian part of the Eastern Archipelago and the continent of Australia itself. Africa has no true *Perichæta*, except *P. capensis*, which is also Oriental. In all parts of the Oriental region *Perichæta* is a dominant form, and always constitutes a large proportion of the gatherings of worms from such localities. It is also exceedingly abundant in some of of the West Indian Islands, such as Trinidad, Bahamas, Grenada, Jamaica, Bermudas, and Barbados. It occurs more rarely upon the South American Continent. The following species are already known to occur in both the Old and the New Worlds:—*P. indica*, *P. sumatrana*, *P. houlleti*, *P. dyeri*, and *P. posthuma*. Peculiar to the New World, so far as published records go, are *P. sancti jacobi*, *P. ringeana*, *P. elongata*, *P. pallida*, *P. bermudensis*, *P. barbadensis*,

and *P. hesperidum*. I am able now to alter this list, by removing *P. bermudensis*, which I have received from Hong Kong [1], and also adding to the first list *P. violacea* and *P. sinensis*, which I have received from Trinidad and Grenada, and to the second the two new species described in this paper. The first list will then contain eight species, and the second eight. Seeing the large number of species which have been in all probability introduced into the West from the East, it is in my opinion by no means to be taken for granted that the genus *Perichæta* is indigenous in the West Indies and South America. I am disposed to look upon it as a distinctly Oriental genus.

ACANTHODRILUS MACQUARIENSIS, n. sp.

Of several specimens of this apparently new species only two were sexually mature.

It is a small species, measuring about an inch in length, and consisting of some 100 segments.

The *prostomium* is incomplete, not dividing the peristomial segment.

The *setæ* are distant from each other, but not equally so. The two ventral of each side are more closely related than the two dorsal. The actual distances are much as indicated in the following scheme:

$$S_1 \quad 1 \quad S_2 \quad 1 \quad S_3 \quad 1\tfrac{3}{4} \quad S_4,$$

for the anterior segments of the body. Behind the clitellum the distance separating the two ventral setæ is about half that which separates the two dorsal. Towards the xviiith segment and on both sides of it the two setæ of each ventral couple get closer together, and on the xviiith segment these setæ are closer together than anywhere else. A similar convergence of the setæ towards the segment bearing the male pores has been noticed in various species of the genus *Microscolex*. On the xviith and xixth segments the ventral setæ are altogether absent, being replaced by the penial setæ.

The *nephridiopores* open in front of seta 3.

One of the two sexually mature individuals had no *papillæ*; upon the other there were a pair of these structures corresponding in position to the ventral setæ. One of them was evidently abnormally situated, for they were upon different segments, the right-hand one upon the tenth, the left-hand upon the eleventh segment. The clitellum occupies segments xiii.–xvi., commencing at about the middle of the former segment. It is continuous across the ventral surface except perhaps for the last of the segments over which it extends.

The *oviducal pores* are paired, and upon segment xiv. each lies in front of seta 1.

The *male pores* (on xviiith) are to the outside of seta 2. The spermiducal gland-pores correspond in position to the outer seta

[1] Typical specimens, not doubtful *P. hawayana*; see pp. 202–203.

of the ventral couple. The spermathecal pores have a position corresponding to that of the glands. As to internal anatomy, I could find no well-developed gizzard; this, if present, is certainly rudimentary. The intestine appears to begin in the xvith segment.

The last *heart* is in segment xii.

The *sperm-sacs*, very racemose in character, are in segments xi., xii.

The *spermathecæ* are in segments viii., ix. Each is an oval pouch with two diverticula of the same form, but smaller, one on each side.

The *spermiducal glands* are not very long and but slightly coiled.

There were two fully developed *penial setæ* in the bundle which I extracted for examination, and four immature ones. The fully mature setæ are ornamented upon the distal one-fourth by sparsely scattered triangular, often rather blunt and not very large tubercles. These were also apparent upon all the immature setæ.

Hab. Macquarie I., S. of New Zealand[1].

Remarks.—It will be obvious from the above description that the present species cannot be possibly confounded with any New Zealand species, with which it would be natural to compare it in the first place. There are in New Zealand no members of the genus *Acanthodrilus* (s.s.) which present the following combination of characters:—Setæ distant, gizzard rudimentary, clitellum short (xiii.–xvi.), nephridia not alternating, spermathecæ with two diverticula. *Acanthodrili* with these characters are restricted in range to Patagonia, S. Georgia, and the Falkland Islands. The Patagonian group thus characterized contains four species, viz., *A. bovei*, Rosa, *A. georgianus*, Mich., *A. falclandicus*, F. E. B., and *A. aquarum dulcium*, F. E. B., which furthermore agree in being all of small size. The only difference which distinguishes *A. macquariensis* from these is the form of the penial setæ and the position of the genital papillæ. It is a most interesting fact, and one which has an obvious bearing upon the theory of a former northward extension of the Antarctic continent, that from Macquarie Isl., 600 or 700 miles south of New Zealand, and therefore so much nearer the existing southern continent, a decidedly Patagonian and South Georgian form of *Acanthodrilus* should have been met with.

Benhamia indica, n. sp. (Fig. 3, p. 210.)

I have received from Mr. Wroughton, through the kind suggestion of Mr. E. H. Aitken, a number of worms which may belong to a new genus. They are stoutish worms, the largest reaching a length of three or four inches.

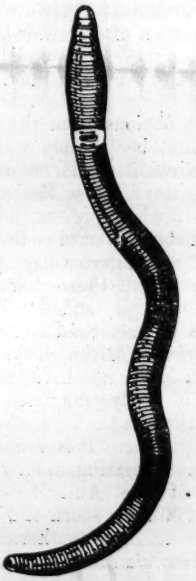
The *prostomium* is large, but does not encroach upon the buccal segment.

The *setæ* of the ventral couple are fairly closely approximated to each other, those of the dorsal couple are distant. The space

[1] I am indebted to Prof. T. J. Parker, F.R.S., for the specimens.

separating the two setæ of the dorsal couple is about two and a half times that separating the two setæ of the ventral couple. The setæ are all grouped on the ventral surface of the body, not extending far laterally. On the xviith, xviiith, and xixth segments the ventral setæ appear to drop out in the sexually mature worms. In an immature specimen the xviiith segment had a pair of ventral setæ in the usual position, but small in size; on the xviith and xixth segments were a pair of very small and quite immature setæ. I did not detect any of these on the opposite side of the body.

Fig. 3.



Benhamia indica. Nat. size.

Dorsal pores were visible at the posterior end of the body, where the worm was less contracted.

There are a series of *genital papillæ* in the region of the spermathecæ. A pair of large papillæ lie upon segment ix.; through it protrude the setæ of the segment, which differ from those of other segments of the body in being modified in structure. They are like those of many Geoscolecids in being rather longer than the ordinary setæ, less curved in form, and in having the distal extremity ornamented with elegantly disposed semicircular ridges. Between this segment and the next, and again on the

boundary segments x./xi., is a single median papilla, upon the middle of each of which is a row, concave forwards, of large pores, which appear to correspond to glands like the capsulogenous glands of *Perichætæ*. Such glands have already been met with in Acanthodrilids (in *Acanthodrilus rosæ*), another fact among many which show the intimate relationship between the two families.

The *clitellum* occupies segments xiii.–xvi.

The *nephridia* are of the diffuse type.

The first *septum* separates segments iv./v. The next three are moderatly thickened, and after the last of these come four, which, though not quite so thick, are to some extent strengthened. All these septa, beginning with the first mentioned, are attached to each other and to the parietes by numerous tendon-like muscular fasciculi. These latter extend for a segment or two farther back than that which is bounded by the last thickened septum. The last heart lies in the xiith segment. The *dorsal blood-vessel* is single. Two stout *gizzards* immediately following each other lie in segments v. and vi. In segments xi. and xii. are a pair of *calciferous glands*. The *intestine* seems to begin in segment xvi. and has a well-developed *typhlosole*, which, however, is not apparent for the first ten segments or so, though it may be possibly present earlier as a rudiment.

The *sperm-sacs* are a single pair in xii. This, however, may be a question of immaturity. On the other hand, although I detected two pairs of funnels belonging to the sperm-ducts, I could only see the testes of segment xi., and the funnels of segment x. were distinctly smaller than the posterior pair.

The *spermiducal glands* are very long and coiled. There appear to be no penial setæ associated with them.

The *spermathecæ* are as usual in viii. and ix. The diverticula near to the external aperture are inconspicuous, but apparently tri- or quadrifid.

Hab. Thana, Bombay (1500 ft. and 2500 ft. altitude).

Remarks.—Though I do not propose, for the present at least, to create a new genus for this species, it differs in several points from any known member of the genus *Benhamia*. It comes nearest perhaps to *Benhamia inermis*, with which it agrees in absence of penial setæ and in the position of calciferous glands

February 4, 1896.

Dr. A. Günther, F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of January:—

The registered additions to the Society's Menagerie during the month of January were 54 in number. Of these 37 were acquired by presentation, 12 by purchase, and 5 were received on deposit. The total number of departures during the same period, by death and removals, was 85.

The following acquisitions are of special interest:—

(1) A young male Manatee from the Rio Purus, Amazons, purchased Jan. 4th.

This animal was brought to Liverpool, from Pará, by Capt. E. J. Collings of the S.S. 'Obidense,' of the Red Cross Line. It appears, so far as I can tell from examination of the living animal, to belong to the Amazonian species distinguished by Natterer many years ago as *Manatus inunguis*, and upon which Dr. Clemens Hartlaub has published an excellent memoir[1].

The living Manatees previously received by the Society have been four in number, namely:—

1. ♀, purchased Aug. 6th, 1875, from Demerara. See P. Z. S. 1875, p. 529.
2. ♂, purchased March 2nd, 1889. See P. Z. S. 1889, p. 160.
3. ♀ ad. } Presented by Sir Henry A. Blake, Oct. 19th, 1893.
4. ♂ jr. } From Jamaica. See P. Z. S. 1893, p. 691.

(2) Two young King Penguins (*Aptenodytes pennanti*) in down plumage, from the Macquarie Islands, south of New Zealand, brought home by Capt. C. S. Milward, of the S.S. 'Otarama,' and purchased Jan. 7th.

Capt. Milward kindly informs us that he received these birds in New Zealand on Nov. 1st, 1895, and that they had been obtained in the Macquarie Islands about Oct. 15th, having been caught only a few days previously. It was stated generally in those islands that the King Penguins are hatched there at the latter end of December or beginning of January, so that these birds are probably about a year old and will shortly moult into their adult plumage.

The following papers were read:—

1. Second Report on the Reptiles and Batrachians collected by Dr. A. Donaldson Smith during his Expedition to Lake Rudolf. By G. A. Boulenger, F.R.S.

[Received January 7, 1896.]

(Plates VII. & VIII.)

The present list refers to the second and concluding portion of Dr. Donaldson Smith's collection. The first instalment, from

[1] "Beiträge zur Kenntniss der Manatus-Arten," Zool. Jahrb. i. p. 1 (1886).

F. Grönvold del. et lith.

Mintern Bros. imp.

AGAMA SMITHII.

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H. Grönvold del et lith.

Mintern Bros. imp.

AGAMA LIONOTUS.

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Western Somaliland and the Galla Country, received in May last, was reported upon in 1895 (see P. Z. S. 1895, p. 530), but some specimens collected on the same route, and which I have only now received, are mentioned in this report. The names of species not included in the first list are marked with an asterisk.

REPTILES.

Chelonians.

1. Pelomedusa galeata, Schoepff.

W. of Juba R., 23.3.95; 24.3.95.

Lizards.

*2. Stenodactylus guttatus, Cuv.

A single specimen from Lake Rudolf, 22.8.95.

It belongs to the stouter form described as *S. mauritanicus*, differing from Oran specimens merely in the somewhat smaller head.

This species was only known from North Africa, from Algeria to Egypt, and North Arabia.

3. Pristurus crucifer, Val.

Berbera, 4.7.94; Boholgarshan, 13.7.94, 15.7.94.

4. Hemidactylus isolepis, Blgr.

A single male specimen. Lake Rudolf, 10.8.95.

Differs from the one previously described in the presence of dark brown bars across the back.

*5. Tarentola ephippiata, O'Sh.

A single young specimen. Sheikh Husein, 14.10.94.

6. Agama vaillanti, Blgr.

A single young specimen. W. of Juba R., 7.3.95.

*7. Agama smithii, sp. n. (Plate VII.)

Head convex, slightly longer than broad. Nostril tubular, directed upwards and backwards, in the posterior part of the nasal, on the canthus rostralis. Upper head-scales moderately large and smooth; a slightly elongate scale on the snout; occipital enlarged; sides of head, near the ear, and neck with groups of spines, the longest of which measure two-thirds the diameter of the tympanum; latter entirely exposed, larger than the eye-opening. Throat much plicate; no gular pouch. Body rather depressed; dorsal scales large, imbricate, keeled, and strongly mucronate, the keels converging towards the vertebral line; lateral scales smaller; 33 scales on the vertebral line between the origin of the fore limbs and the origin of the hind limbs; a short nuchal crest; no dorsal crest; ventral scales small, smooth; 58 scales round the middle of the body. The adpressed hind limb

reaches the eye; tibia longer than the skull; third finger slightly longer than fourth; fourth toe slightly longer than third. Tail rounded; the scales as large as the dorsals and not verticillate. Pale olive-brown above, with traces of dark cross-bands; white beneath, throat with dusky longitudinal streaks.

	millim.		millim.
From snout to vent.	110	Fore limb	60
Head	25	Hind limb	90
Width of head....	23	Tibia.....	30

A single female specimen, with part of the tail missing. Between Shebeli and Juba Rivers, 27.2.95.

This species is intermediate between *A. spinosa* and *A. rueppellii*.

8. Agama doriæ, Blgr.

W. of Juba R., 21.3.95; L. Stephanie, 16.6.95; L. Rudolf.

*9. Agama lionotus, sp. n. (Plate VIII.)

Head rather strongly depressed, as long as broad. Nostril tubular, directed upwards and backwards, in the posterior part of the nasal, on the canthus rostralis. Upper head-scales moderately large, smooth; two elongate scales on the middle of the snout; occipital enlarged; nine or ten upper labials; sides of head, near the ear, and neck with groups of spines, the longest of which nearly equal the diameter of the tympanum; latter entirely exposed, a little larger than the eye-opening. Throat much plicate; no gular pouch. Body strongly depressed; dorsal scales small, broader than long, rounded behind, very feebly and obtusely keeled, the keels converging towards the vertebral line; 50 scales on the vertebral line between the origin of the fore limbs and the origin of the hind limbs; a small nuchal crest; no dorsal crest; ventral scales small, smooth; 65 scales round the middle of the body. The adpressed hind limb reaches the tympanum; tibia slightly longer than the skull; third finger a little longer than fourth; fourth toe a little longer than third. Tail compressed and serrated above, with large, keeled, and mucronate scales forming annuli. Male with a row of anal pores. Dark olive above, lighter on the vertebral line; some of the dorsal scales yellowish; head yellow above, sides near the ear reddish, brick-red beneath; belly and lower surface of limbs bluish grey.

	millim.		millim.
From snout to vent.	130	Fore limb	61
Head	30	Hind limb	92
Width of head....	28	Tibia	32

A single male specimen, with imperfect tail. S.E. of Lake Rudolf, 2.9.95.

Most nearly allied to *A. planiceps*, but distinguished by the larger spines on the sides of the head and neck, and by the very feebly keeled dorsal scales.

10. Agama annectens, Blanf.
Webi Shebeli, 25.12.94.

11. Agama cyanogaster, Rüpp.
Sheikh Husein, 11.10.94; 16.10.94.

12. Varanus ocellatus, Rüpp.
Between L. Stephanie and L. Rudolf, 4.7.95.

13. Latastia longicaudata, Reuss.
Between Shebeli and Juba R., 28.2.95; W. of Juba R., 21.3.95; Lake Stephanie, 11.6.95, 18.6.95.

14. Eremias sextæniata, Stejn.
W. of Juba R., 19.3.25; Boran Country, 24.4.95.

15. Eremias mucronata, Blanf.
13.7.94.

*16. Mabuia planifrons, Ptrs.
A single specimen. W. of Juba R., 7.3.95.

17. Mabuia megalura, Ptrs.
A single specimen. L. Abeia, 22.5.95.

*18. Mabuia quinquetæniata, Licht.
A single young specimen. Between L. Stephanie and L. Rudolf, 4.7.95.

19. Mabuia varia, Ptrs.
Sheikh Husein, 16.9.94.

20. Mabuia striata, Ptrs.
Milmil, 27.7.94.

21. Lygosoma sundevallii, Smith.
Sheikh Husein, 11.10.94; L. Stephanie, 18.6.95.

*22. Ablepharus wahlbergii, Smith.
Smith River, 12.9.94.

23. Chalcides ocellatus, Forsk.
Sheikh Husein, 10.10.94.

24. Chamæleon gracilis, Hallow.
Sheikh Husein, 8.10.94, 10.10.94; Furza, 12.9.94, 12.12.94.

*25. Chamæleon bitæniatus, Fisch.
L. Abeia, 22.5.95.

Snakes.

*26. Typhlops blanfordii, Blgr.

A single specimen, without label.

27. Typhlops somalicus, Blgr.

Sheikh Husein, 8.10.94.

*28. Eryx thebaicus, Reuss.

Between Shebeli and Juba R., 16.2.95, 18.2.95; Lake Abeia, 18.5.95; L. Stephanie, 2.6.95.

*29. Tropidonotus olivaceus, Ptrs.

L. Rudolf, 4.8.95.

30. Boodon lineatus, D. & B.

Sheikh Husein, 23.9.94; 4.10.94; 8.10.94; 19.10.94.

*31. Lycophidium capense, Smith.

W. of Juba R., 28.3.95. A single specimen, belonging to the category B of my catalogue. V. 190; C. 43.

32. Zamenis smithii, Blgr.

W. of Juba R., 7.3.95. A single specimen, ♂, V. 171; tail injured. Pale buff, with brick-red spots; the black bars of the temples extend across the parietal shields.

*33. Philothamnus semivariegatus, Smith.

Madu, 4.3.95. A single female specimen. V. 178; C. 131.

34. Rhamphiophis oxyrhynchus, Reinh.

Lake Rudolf, 6.8.95.

35. Psammophis punctulatus, D. & B.

Lake Rudolf, 6.8.95. A large female specimen, 1660 millim. long, with 184 ventrals and 136 subcaudals.

36. Psammophis biseriatus, Ptrs.

San Kural, 6.1.95; W. of Juba R., 19.3.95.

*37. Dispholidus typicus, Smith.

Sheikh Husein, 8.10.94.

*38. Aparallactus concolor, Fisch.

Boran Country, 24.4.95. A single specimen.

*39. Naia nigricollis, Reinh.

Lake Stephanie, 11.6.95; L. Rudolf, 24.7.95.

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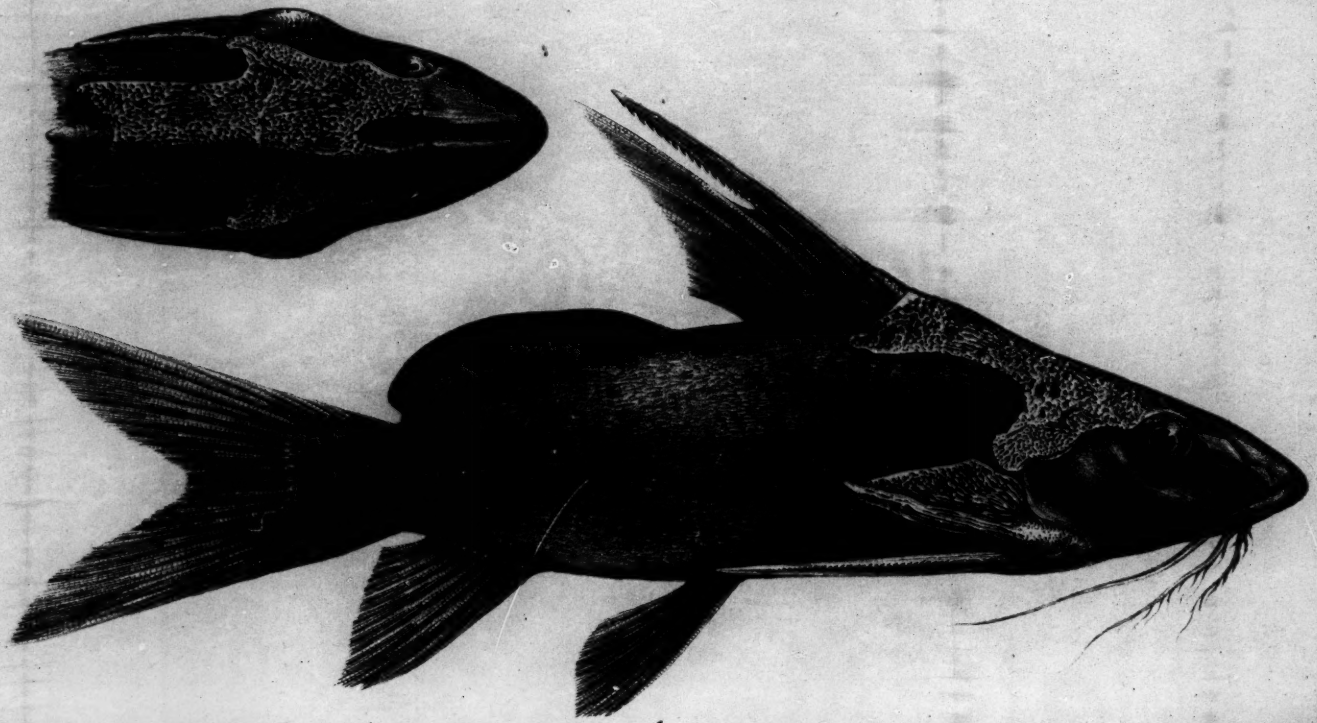


J. Green. delt et lith.

4/5

SYNODONTIS SMITHII.

Mintern Bros. imp.

*40. Dendraspis angusticeps, Smith.
A single specimen, without label.

*41. Bitis arietans, L.
Stonybrook, 19.8.94; W. of Juba R., 22.3.95.

*42. Echis carinatus, Schn.
Lake Stephanie, 11.6.95.

BATRACHIANS.

*1. Rana ornata, Ptrs.
W. of Juba R., 22.3.95; 26.3.95.

2. Rana mascareniensis, D. & B.
Dawa R., 2.3.95; Lake Rudolf, 11.8.95.

3. Cassina obscura, Blgr.
W. of Juba R., 12.3.95; 26.3.95.

4. Bufo regularis, Reuss.
L. Abeia, 11.5.95; L. Stephanie, 11.6.95.

EXPLANATION OF THE PLATES.

Plate VII.
Agama smithii, p. 213.

Plate VIII.
Agama lionotus, with side view of tail, p. 214.

2. Report on a Collection of Fishes made by Dr. A. Donaldson Smith during his Expedition to Lake Rudolf. By Dr. Albert Günther, F.R.S.

[Received January 13, 1896.]

(Plate IX.)

Having been entrusted by Dr. Donaldson Smith with the examination of the Fishes collected by him during his recent expedition in Eastern Africa, I herewith give the result of my examination. Owing to the great difficulties of the transport of preserving materials, the number of specimens had to be restricted, the entire collection amounting to 35 specimens which are referable to 18 species. The chief interest attached to this collection centres in the fishes from Lakes Rudolf and Stephanie,

whence I believe no specimens have been received previously. I distinguish the following eight species among them :—

Polypterus bichir.
Chromis niloticus.
—— *tristrami.*
Synodontis schal.
Citharinus geoffroii.
Alestes rueppellii.
Distichodus rudolphi, sp. nov.
Barbus, sp.

It is a noteworthy fact that five of these species belong to the fauna of the Nile, although they are by no means limited to that river, having been found in various other parts of Tropical Africa. *Chromis tristrami* (or *Acerina zillii*, Gerv.) has been described from fresh and saline waters of the oases of the Sahara; and *Distichodus rudolphi* is closely allied to the Nilotic *D. rostratus*. The other species enumerated in the following list were obtained *en route* to Lake Rudolf or on the return journey, in various localities which will be indicated under the head of the several species.

1. Polypterus bichir, Geoffr.

Two young specimens from Lake Rudolf, both belonging to the variety with ten spines which also occurs in the Upper Nile and West Africa.

2. Chromis niloticus, Hasselq.

Of this widely distributed species, the Bolti of the Nile, three specimens were in the collection.

a. One from Lake Abeia, 24 cm. long; its scales are somewhat fewer in number than in typical specimens, viz. 27 along the lateral line. D. $\frac{16}{13}$.

b. One from Lake Stephanie, 16 cm. long. The teeth of this specimen are equally small, as in the preceding specimen, but fewer in number, possibly owing to its younger age and less advanced growth of the jaws. D. $\frac{15}{13}$.

c. A young specimen from Lake Rudolf, 10 cm. long. D. $\frac{15}{13}$.

3. Chromis tristrami, Gthr.

Specimens from Lake Rudolf cannot be distinguished from the types which were obtained in the oases of the Eastern Sahara. The teeth of this species are much broader and larger than those of the preceding species.

a. A rather large specimen, but with the hinder part of the body decomposed, from Lake Rudolf (12.8.95). D. $\frac{15}{13}$.

b. Another obtained in a dry watercourse, some 10 miles from Lake Rudolf (16.8.95), 15 cm. long. D. $\frac{14}{13}$.

4. CHROMIS SPILURUS, Günth. Proc. Zool. Soc. 1894, p. 89.

This species was discovered by Dr. Gregory in pools remaining in dried-up watercourses of North Giriama. Dr. Donaldson Smith found this species (30.12.94) under similar conditions near the Shebeli River, and (8.12.94) in water-holes near Sheikh Husein. All the specimens, those collected by Dr. Gregory as well as by Dr. D. Smith, are small, not exceeding 12 cm. in length.

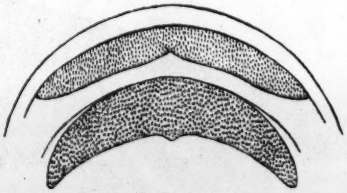
5. CLARIAS SMITHII, sp. n.

Clarias lazera, Günth. P. Z. S. 1894, p. 89 (nec C. V.).

D. 70–73. A. 58–62. V. 1/9.

Vomerine teeth (Fig. 1) granular, forming a very broad band, nearly twice as broad as that of the intermaxillary teeth, with an obtuse, rounded projection behind in the middle of its concavity. Transversely the intermaxillary band is wider than the vomerine. The mandibulary dental band is as broad as the intermaxillary. Upper surface of the head with not very coarse granulations; the length of the head is two sevenths of the total, without caudal. The maxillary barbel reaches beyond the root of the pectoral, the nasal barbel being not quite half its length. The pectoral fin extends to, or nearly to, the origin of the dorsal, the spine being two thirds of the fin. Dorsal fin separated by a short interspace from the caudal.

Fig. 1.



Teeth of *Clarias smithii*.

A single specimen, 45 centim. long, is in the collection, and was captured in the middle course of the Shebeli. The breadth of the intermaxillary band of teeth is 5 millim., that of the vomerine 8 millim.; the transverse width of the former is 51, of the latter 47 millim. A fish captured by Dr. Gregory at Ngatana, and enumerated by me under the name of *Clarias lazera*, is evidently of the same species.

The African species of *Clarias* are extremely similar in general appearance and most difficult to define, chiefly on account of the uncertainty which attaches to almost all the taxonomic characters which have been used for distinguishing them. Some of the characters are certain to undergo considerable changes with age, for instance the vomerine teeth, which are not likely to be granular in very young specimens. The presence or absence of a posterior process of the vomerine band is a more reliable character, as is

proved by the series of *C. gariepinus* in the British Museum. Peters (Reise n. Mossambique) was of a different opinion and has attempted to prove the variability of this character, but, in my view, he has confounded two or even more species under the name of *C. mossambicus*.

Two small specimens of *Clarias* collected on the Shebeli R. (1 Febr., 1895) are not in sufficiently good condition to be determined. The form of the vomerine band is very different from that of the fish described as *C. smithii*. A collection of a large series of specimens of all ages of any species of *Clarias* from the same locality is very much needed; but until this is done, it seems to be safer to utilize all characters observable in apparently mature or nearly mature specimens.

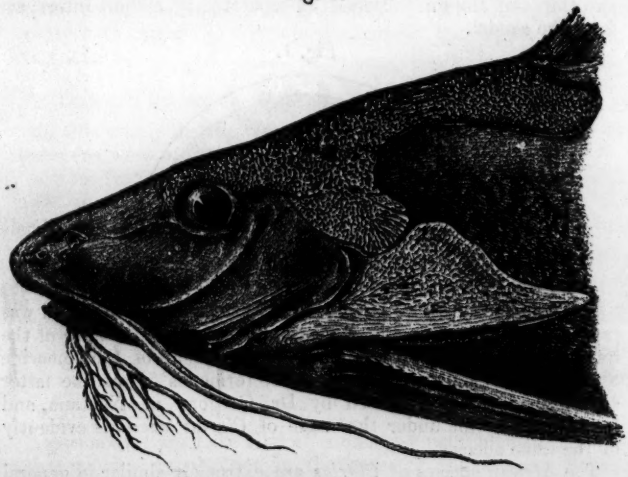
6. Eutropius depressirostris, Ptrs.—Shebeli R.

7. Synodontis geledensis, sp. n.

Allied to *S. serratus* [1].

General form of the body somewhat elongate; snout rather produced, subconical; diameter of the orbit two sevenths of the length

Fig. 2.



Synodontis geledensis.

of the snout. The gill-opening extends downward to before the root of the pectoral fin. Mandibulary teeth in moderate number,

[1] I must again draw attention to an unfortunate clerical error in Cat. Fish. v. p. 212, where the line "B. Mandibulary teeth not longer than the eye," ought to have been placed *above* "*Synodontis serratus*."

shorter than the eye, in a very narrow band. The maxillary barbels reach to the end of the humeral spine and are lined with a narrow membrane interiorly. Mandibulary barbels reaching to the root of the pectoral, provided with numerous long fringes. Nuchal carapace tectiform, obtusely rounded behind, its end reaching to below the first soft dorsal ray. Humeral spine not quite extending so far backward, much longer than high, with its upper margin deeply excised, terminating in a sharp point.

Adipose fin rather long, the interspace between it and the dorsal being less than the base of the latter. Dorsal spine serrated anteriorly, shorter than the pectoral spine, which is strongly serrated along both edges and equal to the distance of the foremost part of the soft part of the trunk from the snout. Dorsal and pectoral spines and the caudal lobes produced into filaments. Coloration uniform.

D. 1/7. A. 11. P. 1/9.

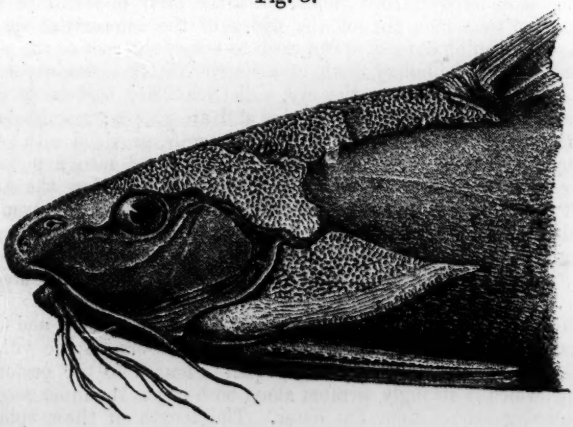
A single specimen, 30 cm. long, was obtained on Jan. 19, 1895, at Geledi on the Shebeli.

This fish is closely allied to *S. serratus*, but sufficiently distinguished by the different form and outline of the cephalic carapace.

8. SYNODONTIS SCHAL, Bl. Schn.

As the specimen in the collection differs in some respects from the typical form, I give a description of it.

Fig. 3.



Synodontis schal.

D. 1/7. A. 12. P. 1/9.

Rather stout in general habit; snout comparatively broad; diameter of the orbit two fifths of the length of the snout, and of

the width of the interorbital space. The gill-opening extends downward to before the root of the pectoral fin. Mandibulary teeth in a very narrow and short row, less than 20 in number, shorter than the eye. The maxillary barbels do not reach the end of the humeral spine and are simple; mandibulary barbels reaching to the root of the pectorals, sparsely provided with fringes. Nuchal carapace tectiform, compressed into a median ridge, rather pointed behind, its end reaching to below the first soft dorsal ray. Humeral spine reaching equally far backward, much longer than high, with its upper margin oblique and nearly straight, terminating in a sharp point. Skin of the side of the body villous.

Adipose fin moderately long, the interspace between it and the dorsal being less than the base of the latter. Dorsal spine short, with a sharp anterior edge which shows scarcely a trace of serrature about the middle of its length, and is probably quite smooth in older examples; this spine is shorter than the pectoral spine, which is serrated along both edges and shorter than the distance of the foremost part of the soft part of the trunk from the snout. Coloration uniform.

A single specimen, 21 cm. long, was obtained in Lake Stephanie on June 11, 1895.

9. Synodontis smithii, sp. n. (Plate IX.)

D. 1/7. A. 13. P. 1/9.

Rather stout in general habit; snout comparatively broad, not much attenuated in front; diameter of the orbit one half of the length of the snout, and of the width of the interorbital space. The gill-opening extends downward to before the root of the pectoral fin. Mandibulary teeth in a narrow, short series, about 25 in number, shorter than the eye. The maxillary barbels do not reach the end of the humeral spine and are simple; mandibulary barbels reaching to the root of the pectorals, provided with long fringes. Nuchal carapace tectiform, compressed into a median ridge, rather pointed behind, its end reaching to below the first soft dorsal ray. Humeral spine reaching equally far, or even a little farther backward, much longer than high, with its upper margin oblique, but straight, terminating in a sharp point. Skin of the side of the body villous, particularly along the lateral line.

Adipose fin moderately long, the interspace between it and the dorsal being less than the base of the latter. Dorsal spine with a sharp, non-serrated anterior edge, equal in length to the pectoral spine, which is strongly serrated along both edges, the inner serrature being coarser than the outer. The length of these spines exceeds somewhat the distance of the foremost part of the soft part of the trunk from the snout. Coloration uniform.

A single specimen, 24 cm. long, was obtained.

This species is allied to *S. schal*, but distinguished by its enormously long spines.

10. SYNODONTIS PUNCTULATUS, Günth. P. Z. S. 1889, p. 71, pl. viii. fig. A.

A specimen brought from the Webi Shebeli differs somewhat from the types which were collected on Kilima-njaro. Not only is the upper surface of the head granular, not covered by thin skin as in the types, but also the dorsal fins are more approximated.

11. CITHARINUS GEOFFROII, Cuv.

This species extends from the Lower Nile to the Gambia and Niger.

Two very young specimens from Lake Rudolf.

12. ALESTES RÜPPELLII, Gthr.

Hitherto known from the Upper Nile.

One very young specimen from Lake Rudolf.

13. ALESTES AFFINIS, Günth. P. Z. S. 1894, p. 90.

Discovered by Dr. Gregory in the Tana River.

Dr. Donaldson Smith brought home three specimens up to 15·5 cm. in length.

a, *b*. From the Dawa River (25 & 28.2.95).

c. From the Shebeli River (30.8.94).

14. DISTICHODUS RUDOLPHI, sp. n.

D. 21–22. A. 14. L. lat. 100–108. L. transv. 18/24.

The height of the body is contained 3½ times in the total length (without caudal), the length of the head thrice or 3¾ times. Snout rather pointed. Twenty-four teeth in the lower jaw. Silvery, greenish on the back, with nine blackish cross-bars and a large black præcaudal spot.

The two specimens being very young, only 54 millim. long, it would not be safe to introduce more characters into the diagnosis of this species. They were obtained from Lake Rudolf.

15. LABEO GREGORII, Günth. Proc. Zool. Soc. 1894, p. 90.

Discovered by Dr. Gregory in the Tana River.

Dr. Donaldson Smith brought from the Guaso Nyiro a dried specimen, 22 cm. long, which seems to belong to this species. Unfortunately, the form of the mouth is destroyed, owing to the mode of preservation.

16. BARBUS BYNNI, Forsk.

A large specimen of this common Nilotic species, from the Shebeli River.

Two very young specimens, 10 cm. long, from a stony brook running into the Erer R. (17 & 18.8.94), are probably the same species.

17. Barbus, sp.

A very young specimen, 5 cm. long, from Lake Rudolf, cannot be specifically determined.

18. Mormyrus zambanenje, Ptrs.

In a specimen from Geledi on the Webi Shebeli (19.1.95) the dorsal fin is a little more than half as long as the anal. D. 21. A. 41.

3. Remarks on the System of Coloration and Punctuation in the Beetles of the Genus *Calligrapha*. By Martin Jacoby, F.E.S.

[Received January 2, 1896.]

The paper which I have the honour to lay before the Society gives a short account of a somewhat exceptional feature in the Coleoptera, which occurs amongst the Chrysomelidæ in the genus *Calligrapha*, but in no other families of Coleoptera to my knowledge. This genus has its metropolis in Central America, and is represented by numerous prettily marked species, all more or less closely allied. In these insects, the ground-colour of the elytra is always pale yellow, but often assumes a golden hue when the insect is alive: this yellow ground-colour is marked with metallic brown or blue, sometimes violet spots, and stripes, but in many species this colour (if it can be so called) is replaced by reddish-fulvous or brown, not of a metallic hue. The elytra of most Coleoptera are impressed with more or less deep punctures, either arranged in longitudinal rows or irregularly distributed, and even when the elytra are pubescent the punctures will be seen when the hairs are removed. In no other insects of this order do the punctures seem to be dependent on the coloration or pattern of the elytra, or *vice versa*, but both go their own way; but in the case of the genus *Calligrapha* the interesting observation may be made that nearly all stripes or spots, no matter how few or many or what may be their shape, are bounded or surrounded at their margins by a row of deep punctures, deeper than those of the ground-colour, beyond which the colour does not extend. This is very remarkable, since I know of no instance in which punctures assume a circle in other species, much less that circular and longitudinal rows of punctures are found in the same individual according to the design as is the case in *Calligrapha*. The question which strikes one now is, how could this coloration influence a deep punctuation or the latter the colouring of the insect: a few instances are found in which some of the spots or bands are free from punctures at their lower portion, but their outlines are just as well defined as those which have the punctures complete. According to Burmeister, the punctures of the elytra are formed by the interruption of the chitinous matter, causing small pits or punctures to be formed, but the regularity

with which this takes place seems wonderful and to me somewhat analogous to crystallization in inorganic matter. If the elytra are examined from their upper surface, the difference between the larger punctures surrounding the spots and those of the ground-colour is very marked, the latter being irregularly and the others regularly placed; but if the elytra are removed and examined from the inner side, a thin layer of skin covers the entire surface, but the punctures shine through it and seem of nearly equal size and much more numerous. I may further mention, that all the spots or bands on the upper surface seem slightly convex and show rarely any punctures except round their margins. These are all the observations I am able to record; and I must leave to anatomists to form any conclusions, if such are possible, as to the way in which nature has worked here, and whether we could obtain any clue by examining the insect in its native place, when immature and in process of formation, so as to get some idea how colour, so distinct from punctuation, can influence the latter or the reverse, when this is apparently the case in so exceptional an instance as the present. The subject itself is not new, having been noticed by Chapuis and myself some years ago, but I think it well to draw attention to it again, so that more observations may be made, if possible.

4. On the Oblique Septa ("Diaphragm" of Owen) in the Passerines and in some other Birds. By Frank E. Beddard, M.A., F.R.S., Prosector to the Society, Examiner in Zoology and Comparative Anatomy to the University of London.

[Received December 16, 1895.]

The facts which I bring before the Society have been accumulating in my notebook for the last few years, and even now there are numbers of types of Passerine birds which I have not had, and may never have, the opportunity of examining. Less emphasis, therefore, must be laid upon such classificatory conclusions as I venture to bring forward, than upon the actual facts which I record. There are a certain number of desirable Passerine genera represented in the rich spirit stores of the Prosector's department, but not referred to in the present paper; I have thought it unwise to make any use of them, since fresh material is so essential for the proper study of delicate and transparent membranes.

The greater part of the present communication deals with the divergent structure of what Prof. Huxley[1] has termed the "*oblique septum*" in Passerine birds. I may therefore conveniently commence with a description of the normal arrangement of this structure, as it is seen for example in the Duck. And I avail myself of Prof. Huxley's own words[2]:—"The second so-

[1] "On the Respiratory Organs of *Apteryx*," P. Z. S. 1882.
[2] *Loc. cit.* p. 561.

called 'diaphragm' ('diaphragme thoraco-abdominal,' Sappey; 'diaphragmite thoraco-abdominal,' Milne-Edwards) is a more or less aponeurotic fibrous membrane, continuous with the ventral edge of the median dorsal septum and suspended by it, like the roof of a tent, across the thoraco-abdominal cavity. In the middle line, this *oblique septum* slopes downward and forward to the dorsal and anterior face of the pericardium, with which its fibres become firmly connected on their way to their attachment to the sternum. From the median line, the two halves of the oblique septum slope laterally and ventrally until they attach themselves to the parietes of the abdomen behind, to those of the thorax more anteriorly, and to the margins of the sternum in front."

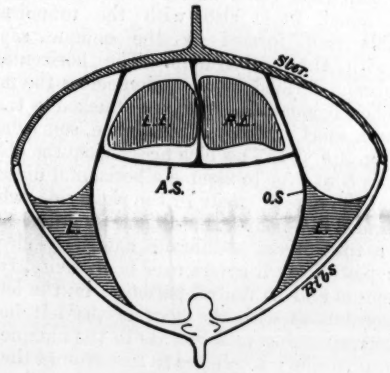
In fact, if we make a transverse section through a Duck or most other birds at the level of about the middle of the sternum, the appearances will be such as are diagrammatically represented in the accompanying drawing (fig. 1, p. 227). Four membranes are there visible—the intestines being left out of consideration for the purposes of simplification, and as not germane to the structures at present under discussion. The first of these is the falciform ligament, which divides the lobes of the liver and is attached below to the middle line of the sternum. Then there are the oblique septum (*O.S.*), attached below to the sternum laterally, and above to the parietes; and finally the horizontal septum (*A.S.*), which floors the two cavities containing the liver-lobes.

This arrangement, however, does not hold good for a number of Passerine birds; and it is possible—though I am not yet in a position to make a definite statement about the matter—that the arrangement which I am about to describe as characteristic of many Passerines will be found to be distinctive of the group. I commence with a somewhat detailed description of the oblique septa of a Crow (*Corvus capellanus*) (see fig. 2, p. 227). As I have dissected three examples of this bird, the following description will probably be found to be free from any record of abnormal conditions.

The right lobe of the liver is considerably larger than the left, and extends some way beyond the margin of the sternum, in fact about as far as to the end of the posterior intermediate air-sac. It is separated from the liver-lobe of the left side as usual by a vertically directed septum, the umbilical or falciform ligament; this falciform ligament is attached to the ventral parietes for a distance of about an inch—from the posterior end of the sternum to a point rather in front of that which corresponds to the posterior margin of the liver. *Anterior to the posterior edge of the sternum, the falciform ligament is not attached to that bone; it becomes fused with the two oblique septa, forming a roof over the liver-lobes in this region, which is separated by a wide interval from the internal surface of the sternum.*

The oblique septa are closely attached for a considerable distance to the liver-lobes, the adhesion being certainly not pathological.

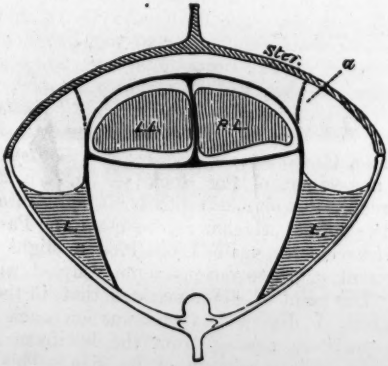
Fig. 1.



Diagrammatic transverse section through the thorax of a Duck.

L., *L.*, lungs; *L.L.*, *R.L.*, left and right liver-lobes; *O.S.*, oblique septum; *A.S.*, horizontal septum.

Fig. 2.



Diagrammatic transverse section through the thorax of a Crow (*Corvus capellanus*).

a, rudiments of sternal attachment of oblique septum. The other lettering as in fig. 1.

At the posterior margin of the sternum the two oblique septa bend inward, and join each other in the middle, becoming here, as already mentioned, fused also with the umbilical ligament; anteriorly this roof formed by the oblique septa becomes continuous with the pericardium. The horizontally disposed roofing membrane formed by the union across the middle line of the two umbilical ligaments is, however, attached to the sternum on both sides for a short space by a membrane, somewhat slight and fenestrated (fig. 2, *a*, p. 227), which arises from the oblique septum just where it is bent over to assume a horizontal direction.

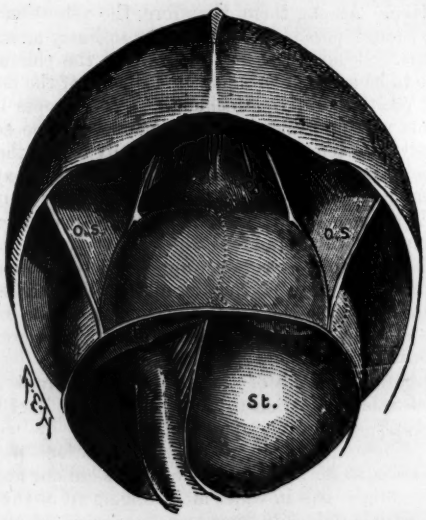
The floor of the hepatic cavity of the right side, whose roof and sides are formed of body-wall, oblique septum, and falciform ligament, is a transparent membrane, anteriorly closely attached to the liver; posteriorly it covers over body-cavity, being attached to oblique septum and to ventral parietes; on the left side of the body it is continuous with the floor of the left hepatic cavity, which has corresponding attachments to the oblique septum and parietes of its own side; it splits so as to surround the gizzard. It is the "horizontal septum," "pseud-epiploon," or "so-called omentum." It follows, therefore, that each liver-lobe in *Corvus capellanus* is contained in a separate cavity, the two being divided by the umbilical ligament; each of these cavities is considerably larger than the liver-mass which it encloses, extending back nearly as far as to the cloaca. It is, however, to the relationship between the oblique septa and the falciform ligament that I desire particularly to call attention in the above description. I find that this peculiar arrangement of the oblique septa and the falciform ligament is not only characteristic of *Corvus capellanus*, but also of other Crows and of other Passerines. The Raven and the Alpine Chough agree absolutely with *Corvus capellanus*; so too *Urocissa magnirostris*, *Paradisea minor*, *Pastor roseus*, Starling, *Gracula intermedia*, *Ptilonorhynchus violaceus*, *Vidua paradisea*, Spanish Blue Magpie, *Hyphantornis texta*, *Leucodioptron canorum*, *Sturnella ludoviciana*, *Sialia wilsoni*, *Turdus merula*, *Pitangus sulphuratus*, *Furnarius* sp., *Tanagra striata*, *Cardinalis virginianus*, *Fringilla teydea*, and a few others. In a specimen of the Rook (see fig. 3, p. 229) there is a slight difference, the oblique septa being split into two layers, one having the normal attachment, the other the Passerine.

In *Struthidea cinerea*, again, I observed a slight difference in the arrangement of these various septa coupled with a general agreement. The point of difference was that, in the specimen of this bird which I dissected there was on each side a thin transparent partition arising from the falciform ligament and attached to the oblique septum of its side. This membranous partition did not, as it perhaps might have been expected to do, shut off the liver from the posterior portion of the abdominal cavity; it arched over the liver with a semicircular free edge, one half of the liver being in front of it, the other behind.

Leaving aside the characteristics of *Struthidea* for a moment, I desire to direct attention to the general feature of such Passerines

as I have examined—both Acromyodian and Mesomyodian it should be observed—to the peculiarity which they show in the arrangement of the oblique septa. Another distinctive feature of Passerine anatomy is quite desirable. So far as we know at present, there is positively only one character which is absolutely distinctive of Passerine birds. That is, in the condition of the tendon of the *patagialis brevis* muscle as it was described some years since by the late Prof. Garrod [1]. Though it is perhaps easy enough to define the Passeres by a combination of characters, none of these characters are everywhere present. It is therefore of more importance than in some easily definable groups to add to this single character only wanting in the Pseudoscines (*Menura* and *Atrichia*) another which future research may possibly show to be more universal, and which is at any rate found in several genera widely separated from each other.

Fig. 3.



Abdominal and thoracic viscera of Rook displayed by removal of abdominal muscles.

St., stomach; *L.*, liver; *O.S.*, oblique septa. The lobes of the liver are covered by a membrane continuous with the dorsal part of the oblique septa.

This anatomical feature may therefore have a considerable systematic interest. Apart, however, from this, which requires still further proof, the conditions which obtain in the Passerine bird remind one in some degree of the Crocodile. The liver-lobes

[1] Coll. Papers, p. 356.

of that reptile are invested by a closely adherent membrane, which has been thus described by Prof. Huxley [1]:—"A fibrous expansion extends from the vertebral column over the anterior face of the stomach, the liver, and the dorsal and front aspect of the pericardium, to the sternum and the parietes of the thorax, separating the thoraco-abdominal space into a respiratory and a cardio-abdominal cavity, and representing the oblique septum of the bird." Both I [2] and Mr. G. W. Butler [3] have included in the comparison which Prof. Huxley thus made the omentum of the bird. But this does not interfere with the special likeness which the Passerine shows to the Crocodile, in that the representative of the oblique septum of other birds has not (as a rule) a ventral attachment on each side to the sternum, but that it forms a closely investing sheath to the liver-lobes; but it is very doubtful whether this resemblance is more than a superficial one. It is agreed on all hands that the Passeres are a much, if not the most, specialized group of birds, standing on the very topmost branch of the avian tree. Among them, therefore, the retention of archaic characters, though possible, would not be so likely as among some other groups. Besides, the arrangement of the oblique septa in them seems to be a secondary affair on account of the fact that the original (?) position of the attachment of those septa is indicated by rudiments varying in degree of the portion of the septa which was formerly inserted laterally and ventrally on to the sternum, and the Rook has these membranes complete. This may be in the form of a much-fenestrated membrane, or there may be but a single tag on each side near to the posterior margin of the sternum, or, as in an example of *Prosthemadera novæ-zealandiæ*, the attachment may have been completely retained on one side. I should be disposed, therefore, in spite of certain undeniable likenesses which the Passerines show to the Crocodilia, to regard the relations of the oblique septa in them as a modification of the more prevalent disposition of those parts.

In describing the septa of the somewhat aberrant Australian *Struthidea*, I called attention to the fact that the liver-lobes were partly shut off from the subomental space by membranous partitions. The exact way in which these partitions are related to the liver-lobes is, so far as my experience goes, unique among birds. But there are other birds in which an arrangement of the same kind exists; but with certain differences.

In several birds, for instance in *Chrysotis guildingi*, the left liver-lobe is completely shut off from the subomental space by a vertical transverse partition; there is no corresponding partition on the opposite side of the body. There are some birds in which, as in *Struthidea*, there are partitions on both sides; but in them the partitions are quite complete and entirely shut off the liver-lobes from the subomental space, not merely partially as in *Struthidea*.

[1] *Loc. cit.* p. 568.
[2] "On the Respiratory Organs in certain Diving Birds," P. Z. S. 1888, p. 256.
[3] "On the Subdivision of the Body-cavity in Lizards &c.," P. Z. S. 1889, p. 453.

This state of affairs I have found in certain Hornbills and in many Owls. At present I have not surveyed the principal groups of birds from this point of view; but some years since I described the same thing in a Penguin. Apart from this latter instance, which I hope to have the opportunity of re-examining, it is interesting to find a likeness between the Passeres and the Picarian birds, and between both and the Owls.

As to the homologies of this structure outside the Class Aves, I am inclined to liken it to what Mr. G. W. Butler has termed the "post-hepatic septum" in the Teiidæ. This structure, with which I am perfectly familiar from my own dissections, is a transverse septum which is attached to the ventral parietes, and nearly completely shuts off the liver-lobes from the rest of the abdominal cavity. In the Iguanidæ (*Iguana*, *Metopoceros*, *Phrynosoma*) there is apparently a trace of this post-hepatic septum in the shape of a membrane of limited extent which arises from the end of the right lobe of the liver, and is attached to the lateral parietes, forming thus a pocket shutting off the lung of that side of the body. In the Crocodile the membrane covering the liver, which represents a portion of the oblique septa, is reflected below the liver and separates it from the adjacent stomach; this is probably to be also looked upon as a representative of the structures mentioned.

5. A Note upon *Dissura episcopus*, with Remarks upon the Classification of the Herodiones. By Frank E. Beddard, M.A., F.R.S., Prosector to the Society, Examiner in Zoology and Comparative Anatomy to the University of London.

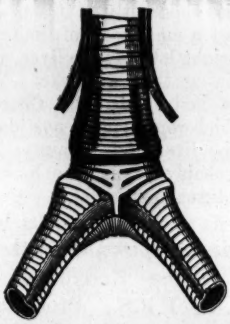
[Received January 13, 1896.]

As is well known, one of the main points of difference between the Ciconiidæ and the Ardeidæ is that the former possess the ambiens muscle, while the latter do not. But the late Prof. Garrod pointed out to this Society[1] some years since that this general rule is not without exceptions; for in *Xenorhynchus senegalensis* and *Abdimia sphenorhyncha* he discovered that the muscle so typical of the Storks was absent. Another point of difference between the Storks and the Herons is in the structure of the syrinx; in the Storks this modified region of the windpipe curiously resembles the syrinx of the tracheophone Passeres, while the Herons have a perfectly typical tracheo-bronchial syrinx. I found myself some years ago[2] that *Xenorhynchus senegalensis*, and more especially *Abdimia sphenorhyncha*, offered some points of likeness to the Herons in the structure of their syringes, which appeared to me to have some significance when correlated with the muscular peculiarity already referred to. In *Abdimia* (*cf.* fig. 2, p. 233),

[1] "Note on an Anatomical Peculiarity in certain Storks," P. Z. S. 1877, p. 711.
[2] "On the Syrinx in certain Storks," P. Z. S. 1886, p. 321.

contrary to what we find in typical Storks (*cf.* fig. 3, p. 234), the membrana tympaniformis is well developed and the bronchidesmus is incomplete. This Stork, however, agrees with other Storks in the absence of intrinsic syringeal muscles and in the modification of a large number of the last tracheal rings. In looking through the MS. notes left by the late Prof. Garrod, with a view to a forthcoming work upon the Anatomy of Birds, upon which I am at present engaged, I find that the two Storks above mentioned are not the only ones in which the ambiens muscle is absent. A third species, viz. *Dissura episcopus*, is precisely in the same condition. This bird is often spoken of as *Ciconia episcopus*; but it seems to me that the anatomical peculiarity referred to justifies its generic

Fig. 1.



Syrinx of *Dissura episcopus*.

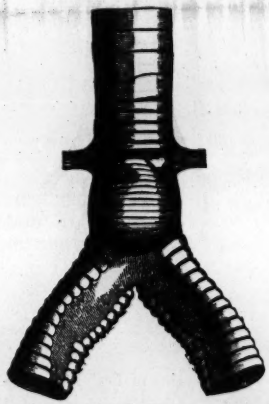
separation—just as Prof. Garrod thought of the species of *Xenorhynchus* which showed the same absence of so characteristic a Ciconiine muscle.

The discovery of this note reminded me that I had preserved at the time of its death the syrinx of a specimen of *Dissura episcopus*. On examining this syrinx, I found that it presented quite the same anomaly of structure (from the Ciconiine point of view) as does *Abdimia*. It is very interesting to find here also—correlated with the deficient ambiens—a syrinx that approaches the Ardeine in its characters. In *Dissura*, however, the bronchidesmus is complete as in the typical Storks; but the membrana tympaniformis, as may be seen from the drawing exhibited (see fig. 1), is well developed, quite as well as in *Abdimia* (see fig. 2, p. 233). I need not trouble the Society with a detailed description of the syrinx of the bird, since the accurate drawing shows all its features of interest. It may be generally pointed out that the terminal rings of the trachea are Stork-like as in *Abdimia*, and that there are no intrinsic muscles; but that the membrana tympaniformis is Ardeine, with a well-developed pessulus. This is, in my opinion, an additional reason for placing this species of Stork in a genus distinct from

Ciconia; and it may be possible to regard it as congeneric with *Abdimia*, remembering that both are African in range. In any case we have here a distinct relation between structure and geographical distribution.

The Storks and Herons are contrasted by other structures than those to which reference has already been made in the present communication. I desire now to call the attention of the Society to certain structures which have not hitherto been used in this connection, and which indeed have been but little made use of in the systematic arrangement of birds. These characters are drawn

Fig. 2.



Syrinx of *Abdimia sphenorhyncha*.

from the number and position of the muscles of the lungs, those muscles which usually arise from the ribs and expand over the pulmonary aponeurosis. To the complete set of these muscles the term "diaphragm" has been applied. But at the present moment I am not concerned with their general morphology, but with their use in detailed classification.

It has been stated by Prof. Weldon [1] that in the Storks "the pulmonary aponeurosis is not muscular." So far as my experience enables me to say, that statement is nearly but not absolutely true.

In a specimen of *Ciconia alba* I found a single muscle on each side of the body arising from the most anterior of the ribs bordering upon the lung, and lying just in front of the anterior intermediate air-sac. The rest of the pulmonary aponeurosis was perfectly free from muscles. On the other hand, the Herons are well provided

[1] "On some Points in the Anatomy of *Phœnicopterus*," P. Z. S. 1883, p. 640.

with special lung-muscles, as can be seen in dissections of *Nycticorax* and *Cancroma*. In the former bird there are four pairs of muscles arising from the rib, each individual muscle, of course, from a single rib. But in addition to these, two muscles arise on each side from the bronchus just where it enters the lung-substance and fan out over the aponeurosis; they both spring from the posterior surface of the bronchus and diverge slightly from each other to their insertion.

Fig. 3.

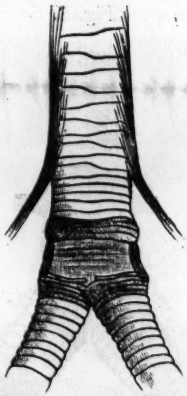


Diagram of the syrinx of *Leptoptilus* (see p. 232).

The origin of these muscles from the bronchus is interesting in view of a very similar relationship of lung-muscles to bronchi which I described some years ago in the Condor[1]; but in the latter bird the muscles are attached at the distal end to the parietes and not to the lung-surface, though, as in *Nycticorax*, they arise from the bronchi.

In *Cancroma* five pairs of ribs border the area occupied by the lungs. From the last four of these arise slender slips of muscle which passing forward end upon the pulmonary aponeurosis. The bronchi in this Heron have not the broncho-pulmonary muscles of *Nycticorax*. It seems, therefore, that we have here a character which serves to distinguish the Ardeidæ from the Ciconiidæ.

The Syrinx of the Ardeidæ.—Though the syringes of such of the Ardeidæ as I have been able to examine differ but little among themselves, it may be useful to give a short account of what I have ascertained, since but little, so far as I am aware, has been published on the matter.

[1] "Notes on the Anatomy of the Condor," P. Z. S. 1890, p. 146, woodcut fig. 3.

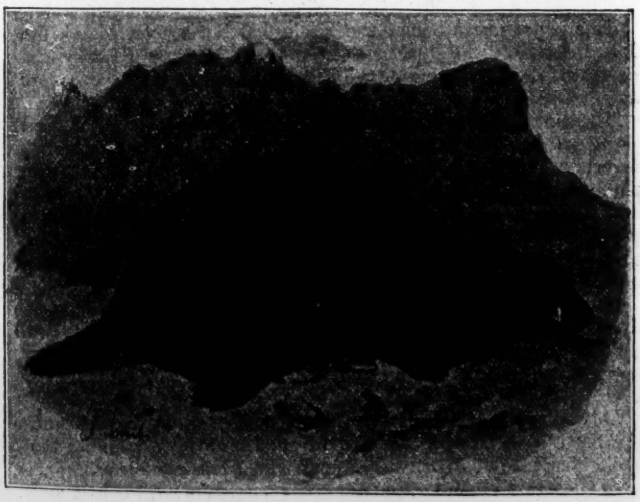
Nycticorax griseus may serve as a typical Heron upon which to hang the description of such slight divergences from the normal as exist. Reckoning as the last tracheal ring that from which the pessulus arises in front, the intrinsic muscles, which are narrow and do not fan out much, are attached to the third bronchial semiring; on the posterior aspect of the syrinx the last tracheal ring is incomplete, the pessulus being attached to the one in front. The widest bronchial semirings (seen laterally) are the third and fourth; they are also the last ossified ones. I can detect no difference in *Ardea cinerea*, *A. cocoi*, *A. agami*, *A. candidissima*, *Nycticorax violaceus*, and *Tigrisoma brasiliense*. In *Ardea ludoviciana* each muscle is much fanned out and almost divided into two muscles, of which one is inserted near to hinder border of rings.

6. Additional Note on the Sea-Otter.

By R. Lydekker, F.R.S.

[Received January 10, 1896.]

In reference to my note on the Sea-Otter (*Latax lutris*), published in the Society's Proceedings for 1895 (p. 421), I have received another communication from my correspondent Mr. H. J. Snow, of Yokohama. He therein tells me that I have misunderstood the



Sea-Otter in walking posture.

meaning of his statement that "the hind flippers are doubled back." In interpreting this as meaning that they were bent

back like those of a Seal, I found great difficulty, from the conformation of the skeleton, in comprehending how this could be effected. Mr. Snow writes me that "the hind flippers, when the Otter is travelling on shore, are brought under the body, but doubled up backwards, somewhat after the manner of the rough sketch enclosed, which, I may mention, has been drawn by a friend —who never has seen a Sea-Otter—from my description. This sketch [which forms the basis of the figure, p. 235] fairly represents the animal, but the hind quarters are not quite correct.

"The human hand will serve as a good illustration of the hind flippers of the Otter, the under part of the flipper corresponding to the palm of the hand. Imagine a hand, the fingers united by a thin web, the whole surface on both sides, with the exception of five small, black, naked spots on the balls of the finger, covered with hair. The Otter apparently has little or no muscular power in the finger part of its flippers, and when attempting to walk, or rather jump, along on shore, this part is doubled under the portion corresponding to the knuckles of the hand."

7. On the Hyoid Bones of *Nestor meridionalis* and *Nanodes discolor*. By St. George Mivart, M.D., F.R.S.

[Received January 15, 1896.]

In a paper read [1] before the Zoological Society on March 5th last, I described the structure of the hyoids of certain Lories, and compared them with that of *Psittacus erithacus* and that of *Stringops habroptilus*.

Therein I called attention to the processes which I named *parahyal processes*, and which, so far as I have been able to ascertain, seem peculiar to the Psittaci. I pointed out that the three genera of Lories described and figured, namely, *Eos*, *Lorius*, and *Trichoglossus*, differed from other Parrots in having these parahyal processes much prolonged and distally united, each pair forming a singularly delicate osseous structure which I termed the *parahyal arch*.

Subsequently, when considering the form of the tongue, I thought it would be very interesting to ascertain whether the two genera, the prolonged lingual papillæ of which have a certain resemblance to those of the Loriidæ, did, or did not, also possess a *parahyal arch*.

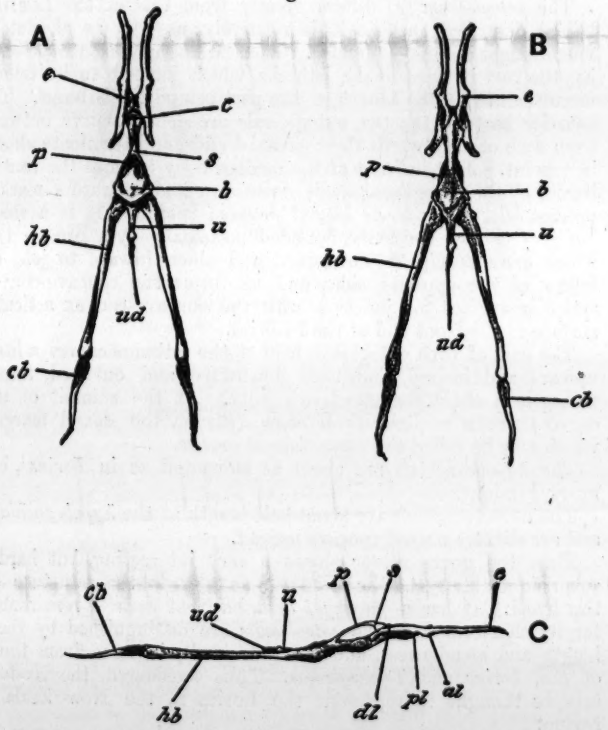
This question, through the kindness of Mr. F. E. Beddard, F.R.S., I have lately been able to determine by examining the hyoid structure of *Nestor meridionalis* and *Nanodes discolor*.

In the hyoid of *Nestor*, the *basihyal* (*b*, fig. 1, p. 237) is long and narrow, much as in the genera of Loriidæ before described. The upper end of its anterior articular surface does not project so much preaxiad as does its ventral lip. The latter is narrow and pointed,

[1] See P. Z. S. 1895, pp. 162-174, figs. 1 to 6.

while the former is laterally expanded and bears dorsally a cup-like depression (*c*). The hinder half of the basihyal bears dorsally a rounded antero-posteriorly extending ridge. The parahyal processes arise much as they do in the Lories previously described, but are exceedingly slender and meet together at a symphysis which is situated about midway between the anterior and posterior extremities of the basihyal. The symphysis is connected with the preaxial part of the basihyal by a rather vertically broad osseous band which passes obliquely backward to it from just behind

Fig. 1.



Hyoid of *Nestor meridionalis*. A. Dorsal aspect; B. Ventral aspect; C. Lateral aspect.

b. Basihyal.
e. Entoglossum.
c. Cup-like concavity.
al. Anterior lateral process.
pl. Posterior lateral process.
dl. Dorsal lateral process.
p. Parahyal arch.
s. Its symphysis.
hb. Hypobranchial.
cb. Ceratobranchial.
u. Urohyal, its larger proximal part.
ud. Urohyal, its smaller distal part.

the cup-like depression above noticed. Each lateral half of the parahyal arch has, medianly, a gentle outward curve.

The *urohyal* is decidedly longer than in the Lories, and consists of two parts—(1) a longer, proximal portion (*u*), which somewhat expands to its termination, where it is truncated; and (2) a very much smaller distal portion (*ud*), about half the length of the proximal part.

It may well be that a distinct distal part of the urohyal also existed in the species before described, but had become detached, since as to several of them it was remarked that the urohyal was truncated at the hinder end.

The *entoglossum* (*e*) differs greatly from that of the Loriidæ before described in that it is relatively, as well as absolutely, much longer and more slender. Each lateral half, each *entoglossal*, has the part in front of the isthmus, which joins it to its fellow, more than twice the length of the part behind the isthmus. The anterior parts of the two entoglossals are slender, curve outward from each other towards their preaxial ends, and terminate almost in a point. Just in front of the median bony isthmus the ventral border of the entoglossal sends downward and outward a marked process (*al*), the *anterior lateral process*; behind this is a sharp but very narrow concavity, bounded postaxially by a process (*pl*) which extends slightly downward and much inward to join its fellow of the opposite side, and so forms the concavo-convex articular surface for junction with the concavo-convex articular surface of the front end of the basihyal.

The part of each entoglossal behind the isthmus curves a little upward and inward, and then downward and outward, terminating in a slightly rounded extremity. At the summit of the curve there is a slight prominence (*dl*) on the dorsal margin, which may be called the *dorsal lateral process*.

The *hypobranchials* are about as elongated as in *Lorius*[1], but nearly straight.

The *ceratobranchials* are about half length of the *hypobranchials*, and are slightly curved concave mesiad.

Thus the genus *Nestor* shows a very interesting, but hardly surprising, affinity to the Loriidæ as regards the structure of the hyoid. It has a *parahyal arch*, but that arch is remarkable for its slenderness, as the *entoglossals* are distinguished by their length and slenderness, and differ decidedly in form from those of *Eos*, *Lorius*, and *Trichoglossus*. Thus considered, the Nestors may be thought to represent the Lories in the New Zealand region.

The interest I felt, however, in examining the hyoid of *Nestor* was greatly exceeded when I turned to the examination of that of *Nanodes*, formerly known as *Lathamus*.

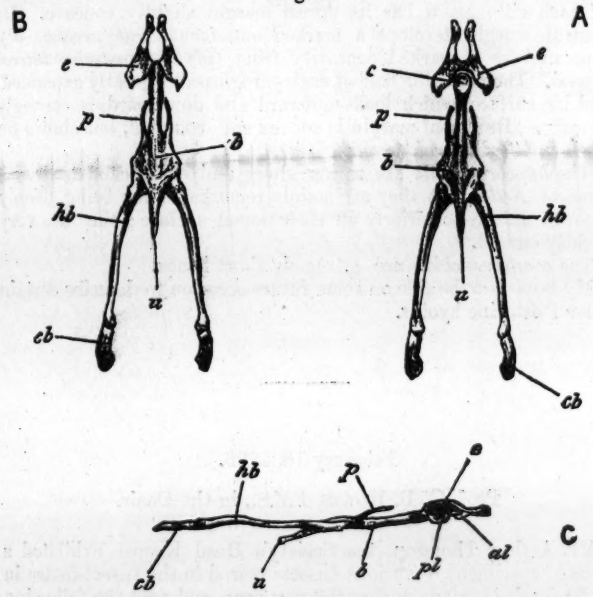
The true position of this species and its relationship or non-relationship to the Lories have been matters of controversy,

[1] P. Z. S. 1885, p. 168, fig. 3.

and were considered by our former Prosectors, Garrod[1] and Forbes[2].

Their opinion was against its Lorine affinity, and in my work (now nearly complete) on the LORIIDÆ I have excluded it from that family.

Fig. 2.



Hyoid of *Lathamus discolor*. A. Dorsal aspect; B. Ventral aspect; C. Lateral aspect.

b. Basihyal.
e. Entoglossum.
c. Cup-like concavity.
al. Anterior lateral process.
pl. Posterior lateral process.
p. Parahyal process.
hb. Hypobranchial.
cb. Ceratobranchial.
u. Urohyal.

The hyoid of *Nanodes* justifies these judgments, for the parahyal processes, though elongated, do not meet to form an arch, and the entoglossum is peculiar and different in form from those of the LORIIDÆ previously examined.

The *basihyal* (*b*) bears a singularly deep depression on its dorsal surface on either side just behind the origin of each parahyal process (*p*). The processes are long and slender, and curve slightly towards each other distally, but, as already said, do not

[1] See P. Z. S. 1873, pp. 466, 634, and 1874, p. 587.
[2] See P. Z. S. 1879, pp. 168, 171, 174, pl. xvi. figs. 1, 2, 8, 10, 12.

meet. On its ventral surface the hinder part of the basihyal is concave, the concavity being bounded on either side by a marked, oblique marginal ridge, these two ridges meeting to coalesce with the *urohyal* (*u*), which is short and straight.

The *entoglossum* (*e*) has its anterior parts rather slender, and its posterior parts greatly expanded transversely. The anterior part of each entoglossal has its dorsal margin slightly concave. Its ventral margin develops a marked *anterior lateral process* (*al*), separated by a marked concavity from (*pl*) the *posterior lateral process*. The posterior half of each entoglossal is greatly expanded, and its surface, which looks outward and downward, is strongly concave. Its dorsal margin is convex and rounded, but shows no marked *dorsal lateral process*.

The *hypobranchials* are rather short and stout compared with those of *Nestor*, but they are mainly remarkable for being deeply grooved antero-posteriorly on their dorsal surface; they are very slightly curved.

The *ceratobranchials* are extremely short bones.

My hope is to be able on some future occasion to describe certain other Psittacine hyoids.

February 18, 1896.

Prof. G. B. Howes, F.Z.S., in the Chair.

Mr. Arthur Thomson, the Society's Head Keeper, exhibited a series of specimens of various Insects reared in the Insect-house in the Society's Gardens during the past year, and read the following Report on the subject:—

Report on the Insect-house for 1895.

Examples of the following species of Insects have been exhibited in the Insect-house during the past season:—

Silk-producing Bombyces and their Allies.

Asiatic.

Attacus atlas.
—— *cynthia.*
—— *ricini.*
—— *pernyi.*
Antheræa mylitta.
**Caligula simla.*
**Rhodia fugax.*
Actias selene.
Cricula trifenestrata.

* Exhibited for the first time.

American.

Attacus lebeaui.
Samia cecropia.
Actias luna.
Telea polyphemus.
Telea promethea.
Hyperchiria io.
*—— *janus.*

African.

Attacus mythimna.
**Antheræa wahlbergi.*
*—— *belina.*
—— *menippe.*
Bunea caffraria.
**Urota sinope.*
Cyrtogone herilla.
Lasiocampa monteiri.
Eudæmonia argus.

Diurnal Lepidoptera.

European.

Papilio podalirius.
—— *machaon.*
Thais cerisyi.
Doritis apollinus.
Melitæa cinxia.
Vanessa antiopa.
—— *polychlorus.*

American.

Papilio ajax.
—— *cresphontes.*
—— *asterias.*
Limenitis disippus.
*—— *ursula.*

Nocturnal Lepidoptera.

Smerinthus populi.
—— *excæcatus.*
Sphinx ligustri.
—— *pinastri.*
—— *celeus.*
Deidamia inscriptus.
Deilephila euphorbiæ.
Darapsa myron.
**Ampelophaga versicolor.*
**Daremma undulosa.*
Ceratomia amyntor.
Eacles imperialis.
Saturnia pyri.
—— *carpini.*

* Exhibited for the first time.

Of the lepidopterous insects which I have the honour to place before the Meeting this evening, the following are exhibited for the first time:—*Limenitis ursula*, *Ampelophaga versicolor*, and *Daremma undulosa*, from North America; *Hyperchiria janus*, from South America; *Caligula simla*, from India; *Rhodia fuyax*, from Japan; *Antheræa wahlbergi*, from West Africa; *Antheræa belina* and *Urota sinope*, from South Africa.

The two specimens of *Limenitis ursula* were reared from hibernating larvæ and were received along with the larvæ of *Limenitis disippus*, of which species I generally get a supply every year. These larvæ emerge from the egg in the autumn and immediately proceed to roll themselves up in the leaves of a species of willow, and in that condition pass the winter. In the spring, as soon as

the young leaves appear, they commence to feed. Last season the young larvæ of *L. disippus* appeared on the 24th of April, and on the 30th passed into the second stage, on the 7th May into the third stage, and on the 13th into the fourth stage, turned to pupæ on the 18th, and the first butterfly appeared on May 22nd. It was not until the perfect insects appeared that examples of another species were to be detected amongst them, so that the larvæ of *Limenitis ursula* and its mode of life must closely resemble those of *L. disippus*.

I have again the pleasure of exhibiting a pair of *Eudæmonia argus*, from Sierra Leone, and I may here mention that, besides the usual differences in the antennæ, the male has only four spots on the hind wings, and the female has always five.

The specimens of *Rhodia fugax* emerged from cocoons deposited in the Insect-house by the Hon. Walter Rothschild, F.Z.S. The larvæ were reared, I believe, in the neighbourhood of Richmond, on willow, from ova imported from Japan. I had some ova of this species, but the young larvæ would not feed and all died. One peculiarity of this larva is, that it makes a squeaking noise when disturbed.

The specimen of *Attacus mythimna* is the second example of this beautiful species exhibited before the Society. This species was originally described and figured, P. Z. S. 1849, p. 40, pl. vii. fig. 3, as were also *Saturnia belina* and *Urota sinope*. Of these last two species *males* only were figured. The specimens exhibited are all females.

Of Orthoptera an example of a very curious locust, *Petasia spumans*, was brought home in December and presented to the Society by Mr. Robert Ganthony, who obtained it from Krugersdorp Falls, near Johannesburg, Transvaal. It fed upon watercress and chewed apple, but I am sorry to say did not live very long in England.

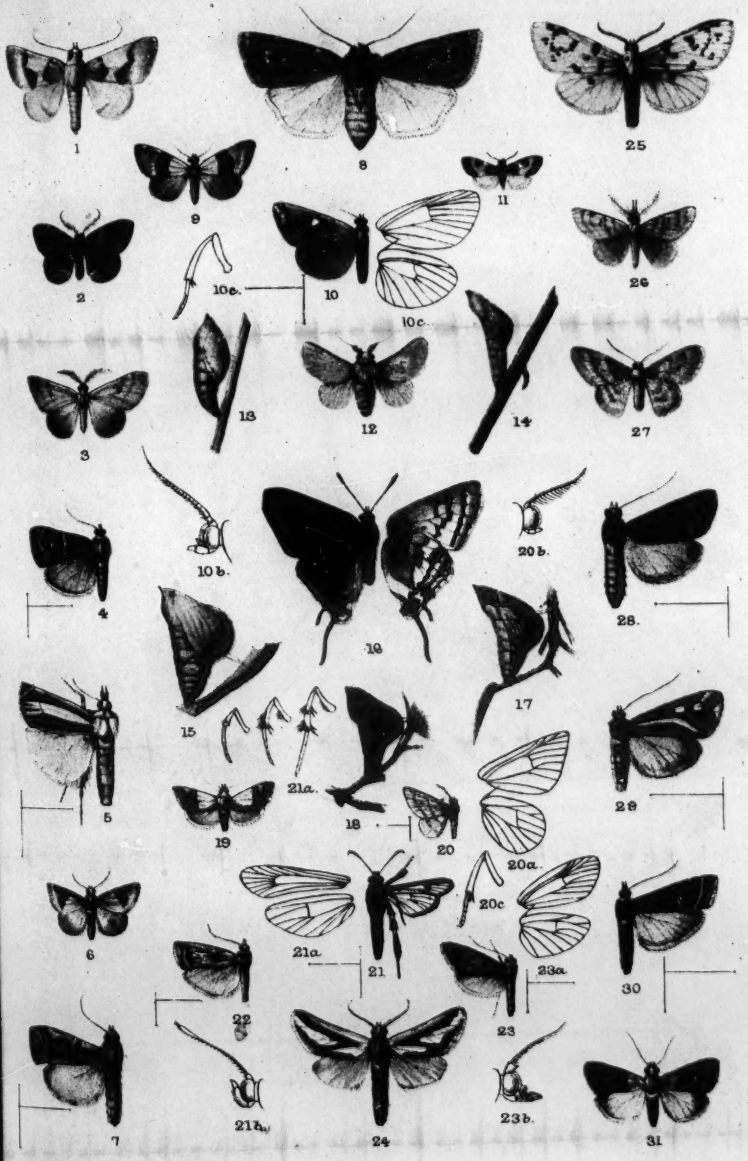
The following papers were read :—

1. On the Butterflies obtained in Arabia and Somaliland by Capt. Chas. G. Nurse and Col. J. W. Yerbury in 1894 and 1895. By Arthur G. Butler, Ph.D., Senior Assistant-Keeper of Zoology, Natural History Museum.

[Received January 29, 1896.]

(Plate X.)

Although the collections now received add only a very few species to the lists of Butterflies published in my papers on the Lepidoptera of Aden and Somaliland (P. Z. S. 1884 & 1885), they are of considerable interest, inasmuch as they contain intermediate forms between species hitherto regarded as distinct.



E.C.Knight del. et lith.

West, Newman, chromo

Lepidoptera from Arabia & Somali-land

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The general character of the Butterflies is distinctly East African, the Asiatic element being chiefly represented by species widely distributed over both Continents, or by African types allied to those found from the Persian Gulf, through Beluchistan to Karachi.

All the specimens collected by Col. Yerbury are presented to the Museum; but of those obtained by Capt. Nurse only such as are of special interest have been forwarded for examination, the types to be retained by us: he, however, adds notes on other species not recorded in the present consignment; I have therefore decided to quote these at the commencement of this paper, my personal observations being given subsequently under the species to which they refer.

The following are Capt. Nurse's notes on his collections:—

"LIMNAS CHRYSIPPUS.

I have not sent any specimens of this species, but I caught and bred all four forms. Like Col. Yerbury, I could not detect the slightest difference in the larvæ, which were all found feeding on *Calotropis gigantea*.

"MELANITIS ISMENE.

Yerbury records this from Lahej and Aden (Journal of Bomb. Nat. Hist. Soc. 1892), but I never came across a specimen.

"YPTHIMA ASTEROPE.

Occurs both in Arabia and Somaliland, but I have never seen one on the Aden peninsula.

"JUNONIA HERE.

I only found this species at Haithallim (spelt by Col. Yerbury Haithalhim) near Lahej[1].

"JUNONIA CLELIA.

Yerbury took one in 1883, but I never saw one.

"JUNONIA CEBRENE.

Common both near Aden and Zaila.

"PYRAMEIS CARDUI.

Common both near Aden and Zaila: I took one on Perim Island, the only Butterfly I saw there except *Catopsilia*.

"HYPANIS CASTANEA[2].

I never saw this species near Aden, but I saw three or four in Somaliland near Zaila: Yerbury found it at Haithallim in 1883.

"HYPOLIMNAS MISIPPUS.

Not uncommon, but I got only one male and five females.

[1] Capt. Nurse says the meaning of the Arabic word is "Where the lime-trees are."

[2] Capt. Nurse quotes this as *H. ilithyia*.

"ACRÆA SEIS.

Given me by Lieut. Sparrow, 7th Dragoon Guards. Obtained when on a shooting expedition.

"CATOCHRYSOPS CONTRACTA.

The males do not appear to differ from specimens of the same sex which I have from Kutch, India; but the females from Kutch are much darker and have not nearly so much blue on the wings.

Mr. De Nicéville in his remarks on the genus *Catochrysops*, in the 'Butterflies of India,' says he is unable to recognize more than three distinct species. *C. contracta*, of course, may be a local race of *C. cnejus*, but the following notes may be of interest in this respect:—At Shaik Othman, near Aden, *C. contracta* is very numerous, but I never saw a *C. cnejus* there. At Lahej, 15 miles away, *C. cnejus* swarms, but I never saw *C. contracta* there. The vegetation at Shaik Othman is very scanty, while there is plenty of rank vegetation round Lahej. In Kutch I never found typical *C. cnejus*, but *C. contracta* swarms.

"CATOCHRYSOPS ASOPUS.

Common at Lahej.

"POLYOMMATUS BÆTICUS.

Common at Zaila and Aden.

"AZANUS SIGILLATUS (=GAMRA?).

Not very common at Aden, and not seen on the Somali coast.

"AZANUS ZENA.

Common at and near Aden.

"LYCÆNESTHES AMARAH.

Common at and near Aden.

"TARUCUS PULCHER sive PLINIUS.

Common at Aden and Lahej.

"TARUCUS THEOPHRASTUS.

Common.

"CHILADES TROCHILUS.

Not very common.

"ZIZERA KNYSNA and Z. GAIKA.

See Col. Yerbury's remarks in Bomb. Nat. Hist. Society's Journal, 1892.

"ZESIUS LIVIA.

Fairly common. I bred this species from seed-pods of *Acacia*

edgworthii. The larva is a fat reddish one, but I did not make any careful notes regarding it.

"IOLAUS NURSEI.

This Butterfly was not common, and I never saw it except at Shaik Othman, where the few specimens I got were taken.

"IOLAUS GLAUCUS.

These were the only specimens I took.

"TERIAS CHALCOMIÆTA.

Common at Lahej.

"TERACOLUS CALAIS, var. DYNAMENE.

I suppose all these are *T. dynamene*. I found the larvæ on *Salvadora persica*, and I also bred some from the egg. The following is a description of the larva:—

Pea-green, very slightly rough; lower part lighter green; a slightly darker mark along back. Some of the larvæ have two black spots dotted with white behind the head, and on some the first half of the streak down the back is whitish, others have it whitish the whole length. Some of the larvæ have black heads, others green heads.

The pupa also is very variable. Some are very pale green, others yellowish brown dotted with black.

The eggs are laid in batches of 20 or 30 on the leaves of the food-plant, and the larvæ remain gregarious for at least half the larval stage. They remind one of Sawfly larvæ. I bred larvæ of all the colours mentioned above from the same batch of eggs.

"TERACOLUS PHISADIA. (Plate X. fig. 13.)

Common at Aden and in the interior. I found the larvæ feeding on *Salvadora persica*. The following is a description of it:—

Pea-green; when young, two black spots on back of head; a white mark, almost the shape of an ace of diamonds, but rather longer, on second segment; when older the black spots on head disappear, and the white mark gets clearer and is outlined with black. There are two similar marks just beyond the centre of the back, the front being the smaller, and another similar mark on eleventh segment.

"TERACOLUS VI.

I did not get many specimens of this species and I could not succeed in finding the larva, though I searched carefully many times.

"TERACOLUS PLEIONE (and T. MIRIAM). (Plate X. fig. 18.)

Very common at Aden, but, like Col. Yerbury, I never saw it elsewhere. I found plenty of the larvæ feeding on *Cadaba*

glandulosa, but I failed to breed it from the egg, though I tried three or four times. The young larvæ never lived more than three or four days, as I could not keep the plant moist enough for them. The following is a description of the larva:—

When young, brownish with black head; when older nearly pea-green, somewhat rough, but no hairs except tiny spines: a pale green line along centre of back; this line almost disappears as the larva becomes full-grown; two rows of small black spots along the sides, much fainter in some specimens. When full-grown about an inch long; somewhat variable in colour. The pupa is somewhat variable, being cream-coloured with dark green markings.

The larvæ are much infested with two different kinds of ichneumons.

"TERACOLUS LEO.

This species was not uncommon near Zaila, but I only took this specimen, as I thought they were all of the same species as I had got at Aden.

"TERACOLUS HALIMEDE. (Plate X. fig. 17.)

These I call *T. acaste*, and I take them all to be of one species. I bred No. 184, and also a male, from larvæ found on *Cadaba glandulosa*. The larva is pea-green, with two small black spots on segment next behind head. It has a cream-coloured line on each side, commencing just before the centre of its length, and running along the rest of the body; just above this line is a tiny black spot on each segment. When full-grown it is rather more than an inch long.

"TERACOLUS EUPOMPE.

This was the commonest Butterfly near Zaila in May and June 1895, but there were very few Butterflies of any kind about. I take them to be all of one species.

"TERACOLUS PHILLIPSI.

Given me by Lieut. Sparrow.

"TERACOLUS EVAGORE [1].

These all appear to me to be *T. nouna*. I cannot think that *T. saxeus* is anything but the same species.

"TERACOLUS COMPTUS.

Given me by Lieut. Sparrow.

"TERACOLUS YERBURII. (Plate X. fig. 14.)

There is probably more than one species in this series, but I find it difficult to separate them; I have therefore sent a good number

[1] One of the extreme types of the female (*T. jamesii*) is confounded with *T. yerburii* in Capt. Nurse's notes, being numbered 229.

of specimens. Most of them, I think, are *T. yerburii*. I bred this species from larvæ found on plant No. 4 (this plant could not be identified at B. M.) at Shaik Othman. The following is a description of the larva:—

Head orange, lateral stripes of the same colour. Ground-colour of back plumbeous, a darker stripe along centre, the whole faintly dotted with white. Below the lateral orange stripe there is a slight protuberance on each segment, black in colour with white dots. The whole larva is covered with short bristly hair.

Pupa:—ground-colour pale lilac, with a purplish stripe along centre and yellow lateral stripes.

From all the pupæ emerged typical *T. yerburii*, except from one which produced *T. nouna*, much to my surprise. I did not notice that one of the larvæ was different from the others, so the larva of *T. nouna* must closely resemble that described above [1].

"Teracolus daira, ♀ (for ♂, see footnote).

I have never come across this form on the Arabian side.

"Teracolus antevippe.

Given me by Lieut. Sparrow.

"Catopsilia florella.

These I cannot properly separate. I bred some *Catopsiliæ* from larvæ found feeding on plant No. 5 (*Cassia* sp.? could not be satisfactorily identified at B. M.). The following is a description of the larva:—

Ground-colour pea-green; a black, interrupted, but very distinct lateral stripe, and below it a broader stripe of an orange-yellow colour. The larva is rough, but not hairy; the whole of the back and head are covered with minute black dots. Length, when full-grown, about 1½ inches.

The pupa is green.

One came out typical *florella* ♀; two others more like *pyrene*.

"Belenois mesentina, var. lordaca.

Swarms at Shaik Othman and in the desert generally. This, both in the larval and imago stages, seems to be the same as *B. mesentina*. The larvæ feed on several plants, are gregarious, hundreds being found on a single bush. They are greenish, slightly hairy; head black, dotted with white; a broad chocolate-coloured stripe on each side, faintly dotted with white. Some of them remained only five days in the pupal stage.

"Belenois leucogyne.

I did not find this species at all common, and only got two or three specimens.

[1] Starved examples of this species were separated and numbered from 252–257 with the note:—"This appears to be something different from *T. yerburii*." The males of *T. daira* were confounded with *T. yerburii*.—A. G. B.

"SYNCHLOE GLAUCONOME.

Common both at Aden and Zaila. The larva feeds on *Cleome paradoxa* in Aden, and inland on other plants. It is greenish yellow, dotted all over with black. Three bluish streaks along the whole length of body. No hairs. About 1¼ inches long when full-grown.

Pupa much the same colours and markings as the larva, but both are fainter.

"HERPÆNIA ITERATA.

Given me by Lieut. Sparrow.

"NEPHERONIA ARABICA.

I only got three or four specimens.

"PAPILIO DEMOLEUS.

Given me by Lieut. Sparrow. Col. Yerbury got several specimens of a *Papilio* (*P. demoleus*, I believe) at Lahej.

"ISMENE ANCHISES.

Two specimens at Aden and one near Zaila.

"CHAPRA MATHIAS.

Common both at Aden and Zaila.

"GEGENES KARSANA.

Fairly common.

"PYRGUS ADENENSIS.

Fairly common.

"I think the differences in the larvæ of such species of *Teracolus* as I have described above are worthy of attention. The larva of *T. yerburii* is not in the least like any of the other larvæ I found; but this was the only red-tipped *Teracolus* larva I got, except one of *T. nouna*, which so closely resembled *T. yerburii* that I did not observe any difference till the imago emerged. The larvæ of *T. pleione* and *T. dynamene* vary to some extent among themselves, but in the case of *T. dynamene* I bred several varieties from one batch of eggs: I got only two or three each of *T. phisadia* and *T. acaste*. All these forms bear a kind of family likeness one to another; and, to some extent, this may be said of *T. protomedia*. I do not know what *Teracolus* larvæ have been described by others; but, judging from the larvæ, *T. yerburii* and presumably the other red-tipped *Teracoli* should not belong to the same genus as the others."

C. G. NURSE.

I am afraid that genera based upon larval coloration would be very unnatural; moreover, the fact that Captain Nurse could not distinguish between the larva of the scarlet-tipped *T. yerburii* and that of the orange-tipped *T. evagore* (=*nouna*), seems to me to

quash the suggestion of generic separation at once, even had it not been shown that the same species, when taken in widely distant countries, differs so completely in larval colouring as to be unrecognizable in this stage of its existence. For example, larvæ of *Agrotis c-nigrum* in Ceylon are altogether dissimilar from European larvæ of the same species; the moths, however, are absolutely indistinguishable.

List of the Species of Rhopalocera.

1. LIMNAS CHRYSIPPUS.

♀. Var. *dorippus*, Klug, Symb. Phys. pl. 48. figs. 1–4 (1832).
♂. Var. *klugii*, Butler, P. Z. S. 1885, p. 758.
♀, Lahej, 28th March, 1895; ♂, Aden, 6th February, 1895 (*Col. Yerbury*).

2. YPTHIMA ASTEROPE.

Hipparchia asterope, Klug, Symb. Phys. pl. 29. figs. 11–14 (1832).
Shaik Othman, 10th February, and Lahej, 5th to 10th March, 1895 (*Col. Yerbury*); 14th February, 8th and 24th May, 1894; Zaila, Somaliland, 28th May and 4th June, 1895 (*Capt. Nurse*).

3. JUNONIA HERE.

Junonia here, Lang, Entomologist, p. 206 (1884).
♂, Lahej, 26th May, 1894 (*Capt. Nurse*); ♀, 14th March, 1895 (*Col. Yerbury*).

4. HYPOLIMNAS MISIPPUS.

Papilio misippus, Linnæus, Mus. Lud. Ulr. p. 264 (1764).
Typical female (resembling *Limnas chrysippus*).
Aden, 12th October (*Capt. Nurse*).

Var. *alcippoides* (resembling *L. alcippoides*).
Aden, 27th February, 1895 (*Col. Yerbury and Capt. Nurse*).

Var. with white on secondaries (resembling *L. dorippus*).
Aden, 28th February (*Col. Yerbury*).

Var. between typical *H. misippus*, ♀, and var. *inaria*.
Shaik Othman, 7th April; Zaila, Somaliland, 23rd May, 1895 (*Capt. Nurse*).

Var. *inaria* (resembling *L. klugii*).
Aden, 24th September, 1894 (*Capt. Nurse*).
The whole of the known variations of the female of this species are therefore represented in these two small collections, all the forms having been taken either at or near to Aden.

5. BYBLIA ACHELOIA, VAR. CASTANEA.

Hypanis castanea, Butler, P. Z. S. 1885, p. 759.
Somaliland (*Capt. Nurse*).

6. Acræa seis.

Acræa seis, Feisthamel, Ann. Soc. Ent. France, 1850, p. 247.

Somaliland (*Capt. Nurse*).

In Mr. Kirby's Catalogue this species was erroneously recorded as a variety of *A. mahela*; consequently it has since been described by Mr. Grose Smith as *A. matuapa*, by Messrs. Godman and Salvin as *A. calyce*, and by Vieillot as *A. mhondana*; it is distributed over Africa from West to East, and we have one example labelled South; the ground-colour varies from almost wholly tawny (probably rose-red in life) to an insect having the primaries almost entirely smoky brown. *A. seis* is the African representative of the Asiatic *A. violæ*, which it nearly resembles both in form and pattern.

7. Catochrysops contracta.

Lampides contracta, Butler, P. Z. S. 1880, p. 406, pl. xxxix. fig. 3.

♂ ♀, Shaik Othman, 3rd March (*Col. Yerbury*), 21st April, 1895 (*Capt. Nurse*).

These Arabian examples do not differ at all from those obtained at Candahar, Beloochistan, and Karachi.

8. Azanus gamra.

Lycæna gamra, Lederer, Verh. zool.-bot. Ges. Wien, 1855, p. 189, pl. i. fig. 3.

♂ ♀, Shaik Othman, 24th February, 3rd March; Aden, 7th and 18th March, 1895 (*Col. Yerbury*).

I think it probable that this may be the species referred to in my former paper on Lepidoptera from Aden as "*A. sigillata*," the specimens being in Col. Swinhoe's collection: the two species are nearly allied, but *A. sigillata* is a small (probably dry-season) form of *A. natalensis*, and shows black spots and no parallel brown bars on the under surface of the disc of secondaries; whereas in *A. gamra* the brown bars replace the extra black spots.

9. Lycænesthes amarah.

Polyommatus amarah, Lefebvre, Voy. Abyss. vi. p. 384, pl. ii. figs. 5, 6 (1847).

♂, Shaik Othman, 24th February, 1895 (*Col. Yerbury*).

The stronger form of wing and the two pencils of elongated scales from the fringe of secondaries show this to be a *Lycænesthes* and not an *Azanus*; the pattern of the under surface is deceptively similar in the two genera.

10. Zizera gaika.

Lycæna gaika, Trimen, Trans. Ent. Soc. ser. 3, vol. i. p. 403 (1862).

♂, Aden, 19th February, 1895 (*Col. Yerbury*).

11. Hyreus lingeus.

Papilio lingeus, Cramer, Pap. Exot. iv. pl. cclxxix. F, G (1782).

♀, Shaik Othman, 1st April, 1895 (*Col. Yerbury*).

12. Zesius livia.

Lycæna livia, Klug, Symb. Phys. pl. 40. figs. 3–6 (1834).

♂ ♀, Shaik Othman, 24th February; ♂, Aden, bred from seed-pods of *Acacia edgworthii*, 4th March; ♂ ♀, Lahej, 12th March; ♀, Shaik Othman, 5th April, 1895 (*Col. Yerbury*).

13. Chloroselas esmeralda.

Chloroselas esmeralda, Butler, P. Z. S. 1885, p. 765, pl. xlvii. fig. 4.

♂; Zaila, Somaliland, 23rd May, 1895 (*Capt. Nurse*).

Mr. Trimen, 'South-African Butterflies,' vol. iii. p. 414, observes:—"On careful comparison of two males taken by Mr. Selous—which quite agree with Mr. Butler's description of *C. esmeralda*—and of three very fine males taken near Durban by Mr. Millar, with the type of *A. pseudozeritis*, I have come to the conclusion that *esmeralda* is identical with *pseudozeritis*." He then proceeds to point out that his type and specimens from Durban are darker below than the others, have a fuscous cloud on the middle disc of the hind wings, the silvery spots very brilliant, and "There are two linear tails on the hind wing, respectively on the first median nervule and the submedian nervure." This, to my mind, settles the question: the Somali examples only have one tail; they are uniformly of a buffish stone-colour below without any clouding. I examined an example, presumably of *C. pseudozeritis*, about a year ago, and decided that it was undoubtedly distinct.

14. Iolaus nursei, sp. n. (Plate X. fig. 16.)

Closely allied to *I. umbrosa* (P. Z. S. 1885, p. 766, pl. xlvii. fig. 6), but the wings above bright cobalt-blue, with two whitish superposed spots on the disc of the primaries, close to the slaty-black outer border; the fringe much whiter, pure white towards external angle: secondaries above with two or three ill-defined white discal spots parallel to outer margin; the outer border pure white, bounded internally by a dusky stripe, including the ordinary black spots, and externally by a sharply-defined black line; fringe pure white with a greyish line: wings below pearly white, the pattern nearly identical with that of *I. umbrosa*, but the bands black-brown instead of red: other differences which exist may be variable and therefore not worth noting. Expanse of wings 35–40 millim.

♂ ♂, Shaik Othman, 3rd March and 3rd April, 1895 (*Col. Yerbury*); ♂, 26th February, ♂ ♀, 31st March (*Capt. Nurse*).

This is doubtless the Arabian representative of the Somali *I. umbrosa*; but it is a far prettier insect.

15. IOLAUS GLAUCUS.

Iolaus glaucus, Butler, P. Z. S. 1885, p. 766.

♂ ♀, Zaila, Somaliland, 23rd and 28th May, 1895 (*Capt. Nurse*).

16. TERACOLUS CALAIS, var. DYNAMENE.

Pontia dynamene, Klug, Symb. Phys. pl. vi. figs. 15, 16 (1829).

♀, Aden, 8th March, 1895; ♂ ♀, 8th and 12th May, 3rd and 7th June, 1894 (*Capt. Nurse*).

17. TERACOLUS PHISADIA, var. ARNE. (Plate X. fig. 13.)

Pontia arne, Klug, Symb. Phys. pl. 7. figs. 1–4 (1829).

♀ ♀, 12th February; Lahej, 6th March; Haithalhim, 23rd March, 1895 (*Col. Yerbury*).

In my paper on Lepidoptera from Somaliland (P. Z. S. 1885), when describing *T. ocellatus*, a species the existence of which I had previously suspected, I observed, "I have also no doubt that a species intermediate between *T. phisadia* and *T. vestalis* will ere long be discovered." In Staudinger's 'Exotische Schmetterlinge' an African species was subsequently described and figured under the name of *Idmais castalis*, which scarcely differs from the Indian *I. vestalis*, and which, as I have since discovered, exhibits similar slight variations.

In my paper on Lepidoptera from Aden (P. Z. S. 1884, p. 478) I pointed out that several species of Butterflies presented simple variations, which had become fixed as local races in various parts of Africa and Asia; and it struck me that in the case of *T. phisadia*, the female of which is extremely variable, we might still expect to find evidence of its derivation from a black and white type similar to those of India; I therefore asked Col. Yerbury to look out for females of *T. phisadia* having this character. In this he was perfectly successful, the two females obtained at Lahej and Haithalhim being indistinguishable from females of *Teracolus ochreipennis* (a species only doubtfully distinct from *T. vestalis*). In this species, therefore, we still have evidence of descent from the black and white forms of India.

18. TERACOLUS VI.

Teracolus vi, Swinhoe, P. Z. S. 1884, p. 435, pl. xxxix. figs. 6, 7.

♂, Aden, 20th February, 1895 (*Col. Yerbury*).

19. TERACOLUS CHRYSONOME.

Pontia chrysonome, Klug, Symb. Phys. pl. 7. figs. 9–11 (1829).

♀, Zaila, Somaliland, 28th May, 1895 (*Capt. Nurse*).

20. TERACOLUS HELIOCAUSTUS.

Teracolus heliocaustus, Butler, P. Z. S. 1885, p. 768, pl. xlvii. figs. 8, 9.

♀, Zaila, Somaliland, 6th June, 1895 (*Capt. Nurse*).

A much faded example.

21. Teracolus leo.

Anthocharis leo, Butler, Ann. & Mag. Nat. Hist. ser. 3, vol. xvi. p. 397 (1865).

♂, Zaila, Somaliland, 4th June (*Capt. Nurse*).

This is the form found at Kilimanjaro, where it is fairly common; it is very constant in all the characters which distinguish it from *T. acaste*.

22. Teracolus halimede. (Plate X. fig. 17.)

♂ ♀. *Pontia halimede*, Klug, Symb. Phys. pl. 7. figs. 12–15 (1829).

Var. ♀. *Pontia acaste*, Klug, l. c. figs. 16, 17 (1829).

Var. ♂ ♀. *Teracolus cœlestis*, Swinhoe, P. Z. S. 1884, p. 435, pl. xxxix. figs. 1, 2.

♂, Lahej, 9th March (*Col. Yerbury*), 22nd May; ♀, 23rd May, 1895 (*Capt. Nurse*).

This heavily-marked form of the species seems to be very rare near Aden, the common types there being vars. *acaste* and *cœlestis* with intergrades.

Var. *acaste*.

♀, Aden, 21st March, 17th April; ♂, 23rd April; ♀, 9th May; ♂ ♀, 5th June, 1895 (*Capt. Nurse*).

Var. *cœlestis*.

♀, Aden, 20th January, 1st and 6th February, 5th April; ♂, 26th April; ♂ ♂, 8th May; ♀, 5th June, 1895; ♀ ♀, 13th July and 25th October, 1894.

23. Teracolus eupompe.

Pontia eupompe, Klug, Symb. Phys. pl. 6. figs. 11–14 (1829).

♂ ♂, ♀ ♀, Zaila, Somaliland, 21st, 23rd, and 28th May, 1895 (*Capt. Nurse*).

Var.? *T. dedecora*, Felder, Reise der Nov., Lep. ii. p. 184 (1865).

♂, Zaila, Somaliland, 18th June, 1895 (*Capt. Nurse*).

24. Teracolus phillipsi.

Teracolus phillipsi, Butler, P. Z. S. 1885, p. 772, pl. xlvii. fig. 11, ♀.

♂, Somaliland (*Capt. Nurse*).

25. Teracolus evagore.

♀ (as ♂). *Pontia evagore*, Klug, Symb. Phys. pl. 8. figs. 5, 6 (1829).

♂. *Anthocharis nouna*, Lucas, Expl. Alg., Zool. iii. p. 350, pl. 1. fig. 2 (1849).

♂. *Anthopsyche heuglini*, Felder, Wien. ent. Monatschr. iii. p. 272 (1859); Reise der Nov., Lep. ii. p. 185, pl. xxv. fig. 4 (1865).

♂ ♀. *Teracolus saxeus*, Swinhoe, P. Z. S. 1884, p. 441, pl. xl. figs. 1, 2.

♂ ♀. Lahej, 21st and 23rd May and 13th December, 1894, 17th February, 6th and 8th May, 1895; Shaik Othman, 21st April; bred specimen, Aden, 31st March, 1895; Zaila, Somaliland, 21st May, 1895 (*Capt. Nurse*).

Capt. Nurse's specimens seem completely to link the following to *T. evagore*, which appears to be an extreme female development of the species.

Var. *Teracolus jamesi*, Butler, P. Z. S. 1885, p. 771.

♀ ♀, Zaila, Somaliland, 4th, 11th, and 21st May, 1895 (*Capt. Nurse*).

26. TERACOLUS COMPTUS.

Teracolus comptus, Butler, P. Z. S. 1888, p. 94.

♂, Zaila, Somaliland, April 1895 (*Capt. Nurse*).
Described from specimens obtained at Kilimanjaro.

27. TERACOLUS YERBURII. (Plate X. fig. 14.)

Teracolus yerburii, Swinhoe, P. Z. S. 1884, p. 441, pl. xxxix. fig. 12.

Var. *Teracolus swinhoei*, Butler, P. Z. S. 1884, p. 491.

Shaik Othman, 24th and 26th February and 3rd March, 1895 (*Col. Yerbury*); 15th April, 1894; 21st and 28th April, 1895; 6th and 13th May, 3rd and 10th June, 1894; Lahej, 23rd and 24th May, 1894; Aden, bred 30th April, 1895 (*Capt. Nurse*); 25th February and 8th March, 1895 (*Col. Yerbury*).

Capt. Nurse also has a specimen bred at Aden on the 19th March, 1895, from larva found at Shaik Othman, and Col. Yerbury seven examples, all of which emerged either on the 11th or 12th April.

28. TERACOLUS DAIRA.

Pontia daira, Klug, Symb. Phys. pl. 8. figs. 1–4 (1829).

♂ ♂, ♀ ♀, Zaila, Somaliland, 21st and 28th May, 4th June, 1895 (*Capt. Nurse*).

29. TERACOLUS ANTEVIPPE.

Anthocharis antevippe, Boisduval, Sp. Gén. Lép. i. p. 572, pl. 18. fig. 3 (1836).

♂, Somaliland (*Capt. Nurse*).

30. CATOPSILIA FLORELLA.

♀. *Papilio florella*, Fabricius, Syst. Ent. p. 479 (1775); ♂ ♀. Butler, Lep. Exot. p. 56, pl. xxii. figs. 1, 2, 2 *a* (1871).

Var. *Colias pyrene*, Swainson, Zool. Ill. 1st ser. pl. 51 (1820–1).

Var. *Callidryas hyblæa*, Boisduval, Sp. Gén. Lép. p. 612 (1836).

Var. *Catopsilia aleurona*, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 489 (1876).

a. *C. florella*, typical, Shaik Othman, ♀, 21st October, 1894; ♀, Aden, 15th, 25th, and 26th March, 1895; ♂, 25th October, 1894.

b. *C. aleurona*, ♂ ♀, Shaik Othman, 3rd February, 1895; Zaila, Somaliland, 22nd and 23rd May, 1895.

c. *C. hyblæa*, ♀, Aden, 21st March, 1895.

d. *C. pyrene*, ♀, Aden, 19th March, 1895; ♂, 18th May, 1894; ♂ ♀, Lahej, 13th and 23rd March, 8th May, 1895; ♂, Zaila, Somaliland, April, 1895.

All these specimens were collected by Capt. Nurse.

31. BELENOIS MESENTINA, var. LORDACA.

Pieris lordaca, Walker, Entom. v. p. 48.

♀, Zaila, Somaliland, April 1895 (*Capt. Nurse*).

32. HERPÆNIA ITERATA.

♂. *Herpœnia iterata*, Butler, P. Z. S. 1888, p. 96.

♀, Somaliland (*Capt. Nurse*).

33. PAPILIO DEMOLEUS.

Papilio demoleus, Linneus, Mus. Lud. Ulr. p. 214 (1764).

Lahej, 3rd, 5th, 6th, and 29th March, 1895 (*Col. Yerbury*); Somaliland (*Capt. Nurse*).

The Arabian examples are slightly aberrant, the band on primaries more broken up than usual, and the under surface of the secondaries greyer; these differences are, however, variable.

34. GEGENES KARSANA.

Hesperia karsana, Moore, P. Z. S. 1874, p. 576, pl. 67. fig. 6.

Shaik Othman, 2nd April, 1895 (*Col. Yerbury*).

35. PYRGUS ADENENSIS.

Pyrgus evanidus, var. *adenensis*, Butler, P. Z. S. 1884, p. 493.

Haithalhim, 25th March, 1895 (*Col. Yerbury*).

36. GOMALIA ELMA.

Pyrgus elma, Trimen, Trans. Ent. Soc. London, 3rd ser. i. p. 288 (1862); Rhop. Afr. Austr. ii. p. 291, pl. 5. fig. 8 (1866).

Gomalia albofasciata, Moore, P. Z. S. 1879, p. 144; Lep. Ceyl. i. p. 183, pl. 71. fig. 7 (1881).

♂ ♂, ♀, Lahej, Arabia, 22nd, 24th, and 25th May, 1894 (*Capt. Nurse*).

The two males are very dissimilar, one being very dark and small, the other larger and almost as pale as the female; this variability renders it impossible to keep *G. albofasciata* separate.

Col. Yerbury has compiled the following list of Butterflies hitherto found at or near Aden :—

1. Limnas chrysippus.
   Var. alcippus.
   Var. dorippus.
   Var. klugii.
2. Ypthima asterope.
3. Melanitis ismene *.
4. Hypolimnas misippus.
   Var. alcippoides.
   Var. inaria.
5. Junonia here.
6. „ clelia.
7. „ cebrene.
8. Pyrameis cardui.
9. Hamanumida dædalus †.
10. Byblia ilithyia.
11. „ acheloia.
    Var. castanea.
12. Polyommatus bæticus.
13. Catochrysops asopus.
14. „ cnejus.
15. „ contracta.
16. Azanus gamra.
17. „ zena.
18. Lycænesthes amarah.
19. Tarucus plinius (= pulcher).
20. „ theophrastus.
21. Chilades trochilus.
22. Zizera knysna.
23. „ gaika.
24. Hyreus lingeus ‡.
25. Zesius livia §.
26. Iolaus nursei.
27. Terias chalcomiæta.
28. Catopsilia florella.
    Var. aleurona.
    Var. hyblæa.
    Var. pyrene.
29. Teracolus vi.
30. „ phisadia.
31. „ calais.
    Var. dynamene.
    Var. carnifer.
32. „ pleione.
    Var. miriam.
33. „ halimede.
    Var. acaste.
    Var. cœlestis.
34. „ protomedia.
35. „ eupompe.
36. „ epigone.
37. „ evagore.
    Var. saxeus.
38. „ yerburii.
    Var. swinhoei.
39. Belenois mesentina.
    Var. lordaca.
40. „ leucogyne.
41. Synchloe glauconome.
42. Nepheronia arabica.
43. Papilio demoleus.
44. Ismene anchises ‖.
45. Chapra mathias.
46. Gegenes karsana.
47. Pyrgus adenensis ¶.
48. Eretis djælælæ.
49. Gomalia elma.

* Not uncommon at Lahej; though no specimens have been obtained.

† Taken by Mr. Chevallier at Haithalhim, and identified at the British Museum.

‡ A single specimen taken at Shaik Othman.

§ Col. Yerbury believes that two species are confused under this name.—A. G. B.

‖ Col. Yerbury enumerates another species—"The Phantom Skipper"—often seen but never taken.—A. G. B.

¶ The Adenese representative of the Indian *P. evanidus*.

Some further Notes on Larvæ from Aden.

Teracolus pleione and *T. acaste* both feed on *Cadaba glandulosa*; *T. protomedia*, *T. yerburii*, and *T. evagore* on a plant that I have been unable to determine.

T. dynamene and *phisadia*, food-plant *Salvadora persica*.

The pupæ of *T. pleione*, *acaste*, and *protomedia* (Pl. X. fig. 15) have considerable resemblance in shape; and it is possible that further study of the pupal stage may lead to a grouping of males with black nervures to their wings. The pupæ of *T. dynamene*, *phisadia*, *yerburii*, and *evagore* are of an altogether different form.

Synchloë glauconome, food-plants *Dipterygium glaucum* and *Cleome paradoxa*.

Belenois lordaca feeds at Huswah on *Caparis galeata*, that is, if this plant be conspecific with the Aden plant bearing the same name (to the uninitiated the plants look allied, but decidedly distinct from each other). I suspect that *T. vi* also feeds on this plant, though I have never yet found a larva in spite of careful search.

Catopsilia larvæ feed on *Cassia*, sp., but I have been unable to correctly obtain the specific name of this plant; it is, however, allied to *adenensis*, and may be that species.

Zesius livia.—Specimens bred from the pods of *Acacia edgeworthii* collected in Gold Mohur Valley. At Haithalhim a number of pupæ were found under a large stone; from these, too, a species of *Zesius* emerged.

Limnas.—The larvæ feed on *Calotropis gigantea*.

Seasonal dimorphism does not seem to occur to any extent in the neighbourhood; though it may possibly do so in the case of *Teracolus calais* and *dynamene*.

The year 1883 was very wet, heavy rain having fallen in May, consequently in July a large number of Butterflies appeared—among others, a very brightly-coloured form of *T. calais* (all, I believe, females however): this may point to *T. calais* being the rainy-season form and *T. dynamene* the dry. I never met with this unusually brightly-coloured form in after years.—J. W. Yerbury.

2. On Moths collected at Aden and in Somaliland. By Lord Walsingham, M.A., LL.D., F.R.S., and G. F. Hampson, B.A., &c.

[Received January 29, 1896.]

(Plate X.)

The following paper contains a record of the collections made at Aden and its neighbourhood in the year 1895 by Col. J. W. Yerbury and Capt. C. G. Nurse, and of a small Somaliland collection made at Zaila by Capt. Nurse. It also includes the Heterocera recorded from Aden in a paper by Mr. A. G. Butler in the Society's 'Proceedings' for 1884 (collected by Cols. Yerbury and Swinhoe), and the few Moths recorded from Somaliland by Mr. Butler in his paper on the Lepidoptera of Somaliland in the Society's 'Proceedings' for 1885, nearly all these species, however, being again represented in the collections now worked out.

The Aden forms show, as might be expected, a mingling of the European, N. African, and Western Indian species, the latter decidedly predominating. The number of species is very large for such a barren locality, especially among the *Pyralidæ*, the number of *Phycitinæ* being a marked feature of the fauna, whilst the most interesting new form is the archaic genus of the *Nola* group. The portion of the paper on the *Pterophoridæ*, *Tortricidæ*,

and *Tineidæ* is by Lord Walsingham, the remainder by myself, in which part only such synonymy is given as is necessary to elucidate Mr. Butler's previous paper. The types of the new species have been presented to the collections of the British Museum and Lord Walsingham by Col. Yerbury and Capt. Nurse. —G. F. H.

Arctiidæ.

Lithosiinæ.

Secusio strigata, Wlk. ii. 559.

Zaila, Somaliland.

Deiopia pulchella, Linn. Syst. Nat. i. 2, 884.

Aden; Zaila, Somaliland.

Nycteolinæ.

Earias insulana, Boisd. Faun. Madag. p. 121, pl. 16. f. 9.

Aden; Lahej; Zaila, Somaliland.

Arctiinæ.

Spilosoma arabicum, n. sp. (Plate X. fig. 25.)

Dull greyish white; legs crimson, grey, and black; palpi black above; antennæ black, the basal joint crimson; a crimson line behind the head and streak on shoulders; patagia with paired black spots; abdomen crimson, with dorsal black spots; anal tuft in female grey. Fore wing with more or less black on base of costa; an antemedial series of five black spots bent inwards below median nervure; a black discocellular patch divided into a cluster of spots by the veins; a curved postmedial series of spots, commencing with an elongate spot below costa, and with black specks and spots beyond it below costa and near veins 5 and 2. Hind wing with discocellular spot, and sometimes with two or three submarginal spots.

Hab. Aden (*Yerbury*). *Exp.* ♂ 32, ♀ 38 mm.

Nolinæ.

Genus Archinola, nov.

Palpi porrect, extending about the length of head and thickly scaled, the 3rd joint concealed; maxillary palpi large and triangularly dilated with scales; proboscis small; antennæ of male minutely ciliated, the basal joints dilated with scales; legs and tibial spurs moderate. Fore wing with a few scattered raised scales; vein 3 from before angle of cell; 4, 5 from angle; 6 from upper angle; 7, 8, 9 stalked; 10, 11 free. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 on a long stalk; 8 anastomosing with the cell to near end.

The large maxillary palpi are a most remarkable feature in this genus, which is otherwise near *Pisara*, Wlk., and tends to prove the derivation of the *Nolinæ* group of the *Arctiidæ* from the *Tineidæ*, in close relationship with the ancestor of the *Scopariinæ*, *Schœnobiinæ*, and lower *Pyralidæ*.

ARCHINOLA PYRALIDIA, n. sp. (Plate X. fig. 23.)

♂. Brownish grey. Fore wing slightly irrorated with fuscous; an antemedial erect fuscous line; a postmedial line curved from costa to vein 3, then incurved to below end of cell. Hind wing pale fuscous.

Hab. Aden (*Nurse*). *Exp.* 14 mm.

AGARISTIDÆ.

EUSEMIA THRUPPI, Butl. P. Z. S. 1885, p. 775.

S. of Berbera, Somaliland.

NOCTUIDÆ.

TRIFINÆ.

GLOTTULA ORIENTALIS, Hmpsn. Moths Ind. ii. p. 168.

Aden.

Larva. Head reddish; somites French grey, the 2nd, 3rd, 4th, and terminal two light red; each somite with a black ring, the medial ones broadest. Food-plant *Pancratium tortuosum*.

HELIOTHIS NUBIGERA, H.-S. Eur. Schmett. ii. p. 366.

Heliothis peltigera, Butl. P. Z. S. 1885, p. 776 (nec Schifferm.).

Aden; Somaliland.

HELIOTHIS ARMIGERA, Hübn. Samml. eur. Schmett., Noct. ii. pl. 79.

Aden.

HELIOTHIS PICTIFASCIA, n. sp. (Plate X. fig. 8.)

♀. Grey; thorax variegated with ochreous, the patagia with black and white streak; tarsi ringed with black; abdomen pale grey. Fore wing with ochreous spot at base; some ochreous specks on costa; an ochreous fascia below median nervure from base to outer margin irrorated with black, and with three blackish marks on it; a similar fascia from middle of cell to outer margin, with the elongate ochreous orbicular and rounded reniform stigmata on it; a submarginal series of black and ochreous lunules; a marginal series of black spots; cilia ochreous at base, pale at tips, with series of fuscous spots. Hind wing pure white.

Hab. Zaila, Somaliland (*Nurse*). *Exp.* 38 mm.

EUPLEXIA OPPOSITA, Wlk. xxxii. 667.

Aden.

EUPLEXIA CONDUCTA, Wlk. x. 296.

Perigea inexacta, Wlk. xxxii. 682.

Aden.

PRODENIA LITTORALIS, Boisd. Faun. Ent. Madag., Lép. p. 91, pl. 13. f. 8.

Aden.

PRODENIA MINIMA, Swinh. P. Z. S. 1889, p. 410.

Aden.

SPODOPTERA MAURITIA, Boisd. Faun. Ent. Madag., Lép. p. 92.

Agrotis exempta, Wlk. x. 355 (var.).

Zaila, Somaliland; the var. *exempta* from Shaik Othman, Arabia, and Zaila.

AMYNA SELENAMPHA, Guen. Noct. i. p. 406.

Aden; Zaila, Somaliland.

AMYNA OCTO, Guen. Noct. i. p. 233.

Amyna stigmatula, Snell. Tijd. v. Ent. xv. p. 55.

Aden; Lahej, Arabia.

CALLOPISTRIA LATREILLEI, Dup. Lép. Fr., Noct. iv. pt. i. p. 327, pl. 120. f. 2.

Zaila, Somaliland.

CALLOPISTRIA YERBURII, Butl. P. Z. S. 1884, p. 496.

Aden; Zaila, Somaliland.

CARADRINA EXIGUA, Hübn. Samml. eur. Schmett., Noct. f. 362.

Aden. The larva feeds on *Zygophyllum simplex*.

TATHORHYNCHUS VINCTALE, Wlk. xxxiv. 1476.

Aden.

LEUCANIA SICULA, Treit. x. 2, 90.

Lahej, Arabia.

LEUCANIA UNIPUNCTA, Haw. Lep. Brit. p. 174.

Aden.

NONAGRIA CONFUSA, Wlk. ix. 105.

Lahej, Arabia; Aden.

ACONTHINÆ.

MEGALODES, n. sp.

Aden. A specimen too worn to describe.

TARACHE NOTABILIS, Wlk. xi. 669.

Lahej, Arabia. A pale, slightly-marked specimen; fore wing with the costal marks reduced to specks; hind wing with slight trace of fuscous at apex only.

TARACHE VARIA, Wlk. xxxiii. 772.

Aden.

TARACHE FLAVONIGRA, Swinh. P. Z. S. 1884, p. 522, pl. 47. f. 15.

Aden.

ACONTIA GRÆLSII, Feisth. Ann. Soc. Ent. Fr. vi. p. 300, pl. 12. f. 3.

Zanthodes innocens, Wlk. xv. 1752.

Aden; Lahej, Arabia.

ACONTIA INSIGNIS, Butl. P. Z. S. 1884, p. 500.

Aden.

Larva with three pairs of prolegs; dull orange with interrupted brownish bands between the somites, the four medial bands darker and more prominent; each somite with paired lateral spots; warty and clothed with short bristles. Food-plant *Anarrhinum pedicellatum*.

XANTHOPTERA MESOZONA, n. sp. (Plate X. fig. 9.)

♀. Head, thorax, and abdomen ochreous, the last suffused with fuscous. Fore wing ochreous, a black spot at base of costa and two specks beyond it; a broad medial black band; a black discocellular speck; a faint postmedial line arising from a black spot on costa and excurved below costa; a slightly sinuous silvery submarginal line with black spot inside it on costa; a marginal black line widening at apex. Hind wing fuscous.

Hab. Aden (*Yerbury*). *Exp.* 20 mm.

MARIMATHA SUBFLAVALIS, Wlk. xxxiv. 1205.

Aden.

METACHROSTIS QUINARIA, Moore, P. Z. S. 1881, p. 371.

Shaik Othman, Arabia.

METACHROSTIS ATRIBASALIS, n. sp. (Plate X. fig. 11.)

♂. Head and thorax black; abdomen fuscous, ochreous towards base. Fore wing bright ochreous; the basal area black with erect outer edge; a medial triangular black patch on costa extending almost to lower angle of cell; outer area black with a grey tinge, its inner edge indented at veins 6 and 3. Hind wing pale fuscous.

Hab. Aden (*Nurse*). *Exp.* 12 mm.

This species in facies resembles *Acontia insignis* and *Xanthoptera mesozona*, having the same black and yellow coloration.

EUBLEMMA BULLA, Swinh. P. Z. S. 1884, p. 518, pl. 47. f. 9.

Aden.
The fore wing more ochreous than in Indian specimens.

EUBLEMMA PARVA, Hübn. Eur. Schmett., Noct. fig. 356.

Aden.

EUBLEMMA BIFASCIATA, Moore, P. Z. S. 1881, p. 371.

Aden.

EUBLEMMA DIVISA, Moore, P. Z. S. 1881, p. 371.

Aden.

EUBLEMMA SEMINIVEA, n. sp. (Plate X. fig. 19.)

♂. Head and thorax pure white; base of palpi and abdomen yellowish. Fore wing with the basal half pure white, the costa with two specks and its edge dark; the outer half red-brown, with fine erect black line on its inner edge, which is slightly indented at veins 5 and 2; a triangular white patch on costa before apex; some submarginal black specks; a marginal white line; the cilia grey. Hind wing white; the outer area slightly suffused with ochreous.

Hab. Aden (*Yerbury*). *Exp.* 15 mm.

EUBLEMMA ECTHÆMATA, n. sp. (Plate X. fig. 6.)

♂. Pure white; palpi, antennæ, and abdomen slightly tinged with fuscous; two dark specks on basal half of costa and one on inner margin; an oblique line from middle of costa to inner margin near outer angle, with a triangular patch of pink suffusion beyond it from costa to its apex on vein 2; an indistinct double postmedial line forming a whorl-shaped mark at end of cell; a submarginal series of dark specks; cilia tinged with pink. Hind wing with the outer area suffused with pink; the cilia pink.

Hab. Shaik Othman, Arabia (*Nurse*). *Exp.* 18 mm.

EUBLEMMA ABRUPTA, Wlk. xxxiii. 830.

Aden; Lahej and Shaik Othman, Arabia.

SARROTHRIPINÆ.

PLOTHRIA CELTIS, Moore, Lep. E. I. C. p. 353, pl. 16. f. 8.

Aden.

HYBLÆA PUERA, Cram. Pap. Exot. pl. 103. ff. D, E.

Aden.

CLETTHARRA MINORELLA, Wlk. xxxv. 1730.

Aden.

EUTELIINÆ.

EUTELIA DISCISTRIGA, Wlk. xxxiii. 823.
Aden; Zaila, Somaliland.

GONOPTERINÆ.

COSMOPHILA MESOGONA, Wlk. xiii. 1002.
Aden; Zaila, Somaliland.

COSMOPHILA SABULIFERA, Guen. Noct. ii. p. 404.
Gonitis propinqua, Butl. P. Z. S. 1884, p. 497.
Aden; Zaila, Somaliland.

COSMOPHILA EROSA, Hübn. Zutr. Samml. exot. Schmett. ii. 19, ff. 287, 288.
Aden; Zaila, Somaliland.

CHURIA ARCUATA, Wlk. xii. 779.
Zaila, Somaliland.

QUADRIFINÆ.

NYCTIPAO LATONA, Cram. Pap. Exot. i. p. 20, pl. 13. f. B.
Aden.

POLYDESMA QUENAVADI, Guen. Noct. ii. p. 438.
Aden.

POLYDESMA VETUSTA, Wlk. xxxiii. 875.
Aden.

MELIPOTIS ATROSIGNATA, Wlk. xv. 1770.
Aden.

MELIPOTIS YERBURYI, Butl. A. M. N. H. (6) x. p. 327.
Aden.

MELIPOTIS MELANODONTA, n. sp.

Head and thorax grey, irrorated with brown and black; abdomen brownish ochreous. Fore wing whitish, suffused with pale reddish brown and irrorated with black; an indistinct highly waved antemedial black line; an ill-defined lunulate discocellular mark; traces of two waved medial lines and of a minutely dentate postmedial line excurved beyond cell, then bent inwards to the medial lines; a dentate submarginal line sending some dentate black marks inwards; the marginal area rufous; a marginal series of black striæ; cilia whitish, with three dark patches. Hind wing ochreous, the outer area browner; indistinct sinuous postmedial and curved submarginal lines; cilia white.

Hab. Aden (*Yerbury*). *Exp.* 24 mm.

GNAMPTONYX VILIS, Wlk. xxxiii. 889.

Aden.

PSEUDOPHIA BENENOTATA, Warr. P. Z. S. 1888, p. 313.

Lahej and Shaik Othman, Arabia.

PSEUDOPHIA DEVIA, Swinh. P. Z. S. 1884, p. 520, p. 48. f. 3.

Aden; Lahej, Arabia.

PSEUDOPHIA INDECISA, Wlk. xii. 829.

Aden.

PSEUDOPHIA OCHRIBASALIS, n. sp. (Plate X. fig. 31.)

Head and thorax ochreous; abdomen dirty white. Fore wing with the basal third ochreous, the outer two-thirds fuscous; a short waved subbasal line from costa with grey inside it; a postmedial line excurved and sinuous between veins 6 and 3, with ochreous on its outer edge and ochreous discocellular spot inside it; traces of a dentate grey submarginal line arising from an ochreous mark on costa; a marginal series of white specks; cilia grey at tips. Hind wing semihyaline white, with fuscous marginal band narrowing from costa to vein 2.

Hab. Aden (*Yerbury, Nurse*). *Exp.* ♂ 22, ♀ 26 mm.

SPHINGOMORPHA CHLOREA, Cram. Pap. Exot. ii. pl. 104. f. C.

Sphingomorpha monteironis, Butl. A. M. N. H. (4) xvi. p. 406.

Aden.

OPHIUSA MELICERTE, Drury, Exot. Ins. i. p. 46, pl. 23. f. i.

Achæa catella, Guen. Noct. iii. p. 247.

Aden; Zaila, Somaliland.

Larva a semilooper with broad blue-black dorsal line and paired lateral creamy-white lines; food-plant *Euphorbia systyla*.

OPHIUSA ALGIRA, Linn. Syst. Nat. i. p. 836.

Aden.

HYPÆTRA LEUCOPTERA, n. sp. (Plate X. fig. 1.)

White, very slightly suffused with brown and irrorated with fuscous. Fore wing with slightly sinuous curved antemedial black line, with fuscous suffusion on its inner edge; a postmedial black line slightly sinuous from costa to vein 4, then bent inwards to below end of cell, and outwardly oblique to inner margin, its outer edge with fuscous suffusion, broad in the sinus below middle; a subapical black spot and marginal series of specks. Hind wing with slight postmedial and marginal fuscous suffusion.

Hab. Aden (*Nurse*). *Exp.* 28 mm.

PLECOPTERA REFLEXA, Guen. Noct. ii. p. 430.

Zaila, Somaliland. One female.

REMIGIA REPANDA, Fabr. Ent. Syst. iii. 2, 49, 133.
Remigia conveniens, Wlk. xiv. 1507.
Aden.

REMIGIA FRUGALIS, Fabr. Syst. Ent. vi. p. 601.
Aden; Shaik Othman, Arabia.

TRIGONODES HYPPASIA, Cram. Pap. Exot. iii. pl. 250, E.
Ophiusa anfractuosa, Boisd. Faun. Ent. Madag., Lép. p. 104, pl. 15. f. 6.
Trigonodes acutata, Guen. Noct. iii. p. 283.
Aden.

GRAMMODES STOLIDA, Fabr. Syst. Ent. p. 599.
Aden; Zaila, Somaliland.

ENTOMOGRAMMA NIGRICEPS, Wlk. xv. 1595.
Lahej, Arabia.

THERMESIA RUBRICANS, Boisd. Faun. Ent. Madag., Lép. p. 106, pl. 16. f. 1.
Lahej, Arabia; Zaila, Somaliland.

HOMÆA CLATHRUM, Guen. Noct. iii. p. 207.
Aden.

OPHIDERES MATERNA, Linn. Syst. Nat. i. 2, p. 840.
Aden.

PSEUDOCALPE VAGABUNDA, Swinh. P.Z.S. 1884, p. 519, pl. 47. f. 5.
Aden.

PLUSIA ERIOSOMA, Doubl. Dieffenbach's New Zealand, ii. p. 285.
Zaila, Somaliland.

PLUSIA LIMBIRENA, Guen. Noct. ii. p. 350.
Aden.

PLUSIA NI, Hübn. Noct. pl. 58. f. 284.
Aden.

FOCILLINÆ.

RAPARNA DIGRAMMA, Wlk. xxxiv. 1170.
Aden; Shaik Othman, Arabia; Zaila, Somaliland.
The common form of the species at Aden is the variety *lactea*, but the typical form also occurs.

RAPARNA IMPARATA, Wlk. xv. 1777.
Magulaba mœstalis, Wlk. xxxiv. 1127.
Aden; Zaila, Somaliland.

Deltoidinæ.

Pseudaglossa fumosa, n. sp. (Plate X. fig. 26.)

♂. Palpi obliquely curved; antennæ with long branches diminishing to apex. Pale brown, thickly irrorated with fuscous. Fore wing with some fuscous at base of costa; traces of waved antemedial and two medial dark lines; a discocellular black lunule; a rather more defined postmedial waved line arising from a dark spot on the costa and with traces of another line beyond it; a marginal series of dark specks. Hind wing fuscous, with two dark marks at anal angle.

Hab. Aden (*Nurse*). *Exp.* 18 mm.

Hypena masurialis, Guen. Delt. & Pyr. p. 38.

Hypena obacerralis, Wlk. xvi. 53.

Aden; Zaila, Somaliland.

Hypena lividalis, Hübn. Samml. eur. Schmett., Pyr. ff. 11, 186.

Aden; Zaila, Somaliland.

Hypena abyssinialis, Guen. Delt. & Pyr. p. 39.

Hypena jussalis, Wlk. xvi. 52.

Aden; Shaik Othman, Arabia; Zaila, Somaliland.

Hypena obsitalis, Hübn. Samml. eur. Schmett., Pyr. ff. 164–5.

Aden; Shaik Othman, Arabia; Zaila, Somaliland.

Lymantriidæ.

Thiacidas vilis, Wlk. xxxii. 348.

Zaila, Somaliland.

Euproctis fasciata, Wlk. iv. 809.

Aden.

Larva highly urticating; feeds on a creeper.

Saturniidæ.

Saturnia oubie, Guérin, Voy. en Abyssinie, p. 387, pl. 12. ff. 1, 2.

Somaliland.

Geometridæ.

Boarmiinæ.

Tephrina disputaria, Guen. Phal. ii. p. 489.

Tephrina sublimbata, Butl. P. Z. S. 1884, p. 502.

Aden; Shaik Othman, Arabia.

Tephrina catalaunaria, Guen. Phal. ii. p. 108.

Aden; Lahej and Shaik Othman, Arabia.

Orsonoba clelia, Cram. Pap. Exot. iii. p. 172, pl. 288. ff. B, C.
Shaik Othman, Arabia.

Larentiinæ.

Genus Acidaliastis, nov.

Palpi minute and hardly reaching beyond the frons; proboscis absent; antennæ of male bipectinated; hind tibiæ with the medial spurs absent. Fore wing with vein 2 from towards end of cell; 4, 5 from angle; 6 from above middle of discocellulars; 7, 8, 9, 10 stalked, 7 being given off beyond 10, and 9 near the apex; 11 becoming coincident with 12. Hind wing with vein 2 from near angle of cell; 3, 4 from angle; 5 from middle of discocellulars; 6, 7 on a long stalk; 8 anastomosing with the cell to near end of it.

Acidaliastis micra, n. sp. (Plate X. fig. 20.)

Chalky white. Fore wing with oblique brown line from upper angle of cell to inner margin; a prominent black discocellular spot; an oblique slightly curved brown postmedial line. Hind wing with postmedial black speck on inner margin; both wings with some marginal black specks.

Hab. Aden (*Nurse*). *Exp.* 10 mm.

Acidaliinæ.

Craspedia actuaria, Wlk. xxii. 752.

Aden; Lahej and Shaik Othman, Arabia.

Craspedia jacta, Swinh. P. Z. S. 1884, p. 526, pl. 48. f. 12.

Aden.

Acidalia testacea, Swinh. P. Z. S. 1885, p. 863, pl. 57. f. 15.

Aden.

Ephyra rufistrigata, n. sp. (Plate X. fig. 3.)

Pale brownish ochreous; antennæ with the shaft whitish; wings thickly marked with minute brown striæ and irrorated with a few dark scales; a dark cell-speck and traces of postmedial and submarginal lines. Underside thickly marked with pink striæ and with incomplete pink submarginal line.

Hab. Aden; Shaik Othman, Arabia (*Nurse*). *Exp.* 22 mm.

Emmiltis nigrescens, n. sp. (Plate X. fig. 2.)

♂. Dark brown, irrorated with grey, white, and ochreous. Fore wing with sinuous black antemedial line; a black discocellular spot on an obscure line which is bent inwards below cell; a postmedial line slightly bent outwards between veins 6 and 3, the area between it and the medial line suffused with brown; a sinuous white submarginal line with a more prominent and whiter sinus at middle and dark suffusion on its inner edge. Hind wing browner, with

black cell-specks and pale waved postmedial and submarginal lines; both wings with fine black marginal line.

Hab. Aden (*Yerbury, Nurse*). *Exp.* 18 mm.

Allied to *E.* (*Fidonia*) *megiaria*, Oberth., and its Egyptian race *obscuraria*, Beth.-Baker.

GEOMETRINÆ.

NEMORIA SOLIDARIA, Guen. Phal. i. p. 348.

Shaik Othman and Lahej, Arabia.

NEMORIA PULVEREISPARSA, n. sp. (Plate X. fig. 27.)

♀. Whitish, thickly irrorated and mottled with fuscous brown; both wings with indistinct discocellular spot and waved ante- and postmedial lines. Underside whiter.

Hab. Aden. *Exp.* 22 mm.

NEMORIA DIRECTA, Wlk. xxii. 535.

Aden.

EUCROSTIS DISPARATA, Wlk. xxii. 567.

Aden.

SPHINGIDÆ.

ACHERONTIA STYX, Westw. Cab. Or. Ent. p. 88, pl. 42. f. 3.

Aden; rare.

PROTOPARCE CONVOLVULI, Linn. Syst. Nat. i. p. 798.

Protoparce orientalis, Butl. Trans. Z. S. ix. p. 609.

Aden.

BASIOTHIA MEDEA, Fabr. Spec. Ins. ii. p. 143.

Sphinx idricus, Drury, Ill. Exot. Ins. iii. pl. 2. f. 2.

Aden.

DAPHNIS NERII, Linn. Syst. Nat. i. p. 798.

Aden. *Larva* green or orange. Food-plant *Adenum obesum*.

DILEPHILA LIVORNICA, Esp. Schmett. ii. pp. 87, 196, pl. 8. f. 4.

Aden. *Larva* on *Bœrhavia elegans*.

CHÆROCAMPA ALECTO, Linn. Syst. Nat. i. p. 802.

Aden; May, at flowers of *Poinciana elata*.

CHÆROCAMPA CELERIO, Linn. Syst. Nat. i. p. 800.

Aden.
Larva black or green. Food-plant *Boerhavia elegans*.

MACROGLOSSA TROCHILUS, Hübn. Samml. exot. Schmett. ii.

Shaik Othman, Arabia.

LOPHURA NANA, Wlk. viii. 107.

Aden.

Larva various shades of green or pinkish; a prominent white lateral stripe with a yellowish stripe above it, and some of the ground-colour between the two; some specimens with chocolate-coloured dorsal snake-like markings. Food-plant *Oldenlandia schimpferi*.

CEPHONODES HYLAS, Linn. Mant. p. 539.

Zaila, Somaliland.

PYRALIDÆ.

GALERIINÆ.

ACHRŒA GRISELLA, Fabr. Ent. Syst. p. 289.

Aden.

CRAMBINÆ.

EROMENE OCELLEA, Haw. Lep. Brit. p. 486.

Aden.

EROMENE PAVONIALIS, n. sp. (Plate X. fig. 28.)

Head grey; thorax white, finely mottled with black scales; abdomen pale, suffused with fuscous. Fore wing white, finely and thickly mottled with black scales; traces of an erect antemedial yellow line; a yellow band from lower angle of cell to inner margin, with four black marks on it; a yellow spot with some black scales on it beyond the cell; a postmedial whitish line excurved between veins 6 and 4. Hind wing white, suffused with fuscous towards outer margin; a fuscous marginal line and a dark line through the cilia.

Hab. Aden (*Nurse*). *Exp.* 22 mm.

PLATYTES ICTERICALIS, Swinh. P. Z. S. 1885, p. 876, pl. 57. f. 16.

Lahej, Arabia.

CRAMBUS LEUCOZONELLUS, n. sp. (Plate X. fig. 5.)

♀. Head white; thorax white and grey; abdomen white. Fore wing grey; the costa white, broadening to the subapical line; a white fascia from base along median nervure dividing into three branches towards outer margin, the lowest branch not reaching the margin, a black marginal speck below each branch; the inner margin with diffused white on it; a rufous postmedial line angled outwards on vein 6 and inwards on vein 2, then bent inwards to inner margin; two ferruginous lines across apex, the inner becoming a sinuous submarginal line. Hind wing white.

Another specimen has the costa of fore wing grey; the medial fascia much more diffused and its branches ill-defined.

Hab. Aden. *Exp.* 22 mm.

Ancylolomia chrysographella, Koll. Hüg. Kasch. iv. p. 494.

Aden.

Anerastiinæ.

Anerastia ablutella, Zell. Isis, 1839, p. 177.

Aden.

Polyocha depressella, Swinh. P. Z. S. 1885, p. 876, pl. 57. f. 5.

Aden; Lahej, Arabia.

Polyocha strigicostella, n. sp.

Palpi of male with the 2nd joint hollowed out to receive the brush-like maxillary palpi; antennæ uniseriate, with a tuft of black hair in the basal sinus; fore wing with veins 4, 5 from cell; hind wing with vein 3 stalked with 4, 5.

Head, thorax, and abdomen grey, with an ochreous tinge. Fore wing grey, all the veins defined by fine black streaks; a diffused reddish-ochreous fascia below median nervure, and a short diffused ochreous fascia on base of inner margin. Hind wing pure white.

Hab. Lahej, Arabia (*Nurse*). *Exp.* 26 mm.

Phycitinæ.

Ephestia cautella, Wlk. xxvii. p. 73.

Aden.

Ephestia elutella, Hübn.

Aden.

Homæosoma xanthotricha, Staud. Stett. e. Zeit. 1859, p. 226.

Lahej, Arabia.

Heterographis yerburii, Butl. P. Z. S. 1884, p. 502.

Aden.

Heterographis unipunctella, n. sp.

Palpi of male with the 2nd joint hollowed out to contain the brush-like maxillary palpi; frons with a rounded prominence; antennæ ciliated.

Head and thorax grey and fuscous; abdomen with a rufous tinge. Fore wing grey, thickly irrorated with fuscous; an indistinct dark antemedial line angled inwards in cell, then becoming white, with a fulvous patch on its inner side becoming fuscous at inner margin; a black speck at lower angle of cell; a sinuous dark submarginal line outwardly defined by white, beyond which is a fuscous patch at apex and a fulvous patch from vein 6 to inner margin. Hind wing semihyaline white; the veins, marginal area, and a line through the cilia brown.

Hab. Aden (*Yerbury, Nurse*); Punjab (*Harford*). *Exp.* 18 mm.

HETEROGRAPHIS CARNIBASALIS, n. sp.

♂. Maxillary palpi thickly scaled; frons with a rounded prominence; antennæ laminate.

Head and thorax rufous and grey; abdomen whitish. Fore wing with the basal area rufous, deepening to the antemedial line, which is straight, oblique, white, irrorated with black and inwardly edged with black; the medial, costal, and outer areas irrorated with pink-brown scales, the rest of the medial area diffused with olive-brown; an oblique white postmedial line irrorated with black scales. Hind wing whitish, suffused towards margin with pale brown.

Hab. Aden (*Nurse*). *Exp.* 12 mm.

HETEROGRAPHIS PRONIPHEA, n. sp.

♂. Maxillary palpi minute; frons rounded; antennæ ciliated.

Head grey; thorax and abdomen pale rufous. Fore wing pale rufous, suffused with vinous purple; the costal area white, irrorated with purple, and tapering to base and apex; a white spot on vein 1 before middle; an indistinct straight whitish submarginal line. Hind wing pale brown; the cilia white.

Hab. Aden (*Nurse*). *Exp.* 16 mm.

ANCYLOSIS NIGRITARSEA, n. sp.

♂. Antennæ with slight sinus and roughened scales on base of shaft.

Grey; palpi white, the extremity of 2nd and the 3rd joint black; legs white, the tarsi and extremity of hind tibiæ black; abdomen with pale rings. Fore wing suffused and irrorated with fuscous; the costal area white, irrorated with red scales, and tapering to base and apex. Hind wing white, with pale brown marginal line.

Hab. Shaik Othman, Arabia (*Nurse*). *Exp.* 18 mm.

ANCYLOSIS FUSCOSPARSELLA, Zell.

Aden. Most of the specimens have vein 4 of the hind wing given off just before the margin.

NEPHOPTERYX DIVISELLA, Dup. Lép. Fr., Suppl. iv. p. 126, pl. 60. f. ix.

Aden.

NEPHOPTERYX (THYLOCOPTILA) PAUROSEMA, Meyr. Ent. Mo. Mag. 1885, p. 106.

Lahej and Shaik Othman, Arabia.

NEPHOPTERYX (SALEBRIA) METAMELANA, n. sp. (Plate X. fig. 7.)

Head, thorax, and abdomen grey, the last with the terminal segments blackish in male. Fore wing grey, diffused and irrorated with black; the costal area whiter to the postmedial line; a black basal speck; an obliquely sinuous black antemedial line, with

ochreous band on its inner edge, inside which is sometimes a black spot below median nervure; the two discocellular black specks sometimes conjoined into a lunule and with an ochreous and black mark on costa above them; a submarginal sinuous black line, with ochreous band on its outer edge and diffused black patch beyond it on costa. Hind wing white; both wings with fine black and ochreous marginal line, most prominent on fore wing, which has two fine dark lines through the cilia. Underside of male with a jet-black spot at base of costa of hind wing.

Hab. Aden (*Nurse*). *Exp.* 20 mm.

NEPHOPTERYX (SALEBRIA) NIGRISTRIATA, n. sp. (Plate X. fig. 22.)

♂. Head and thorax white, irrorated with black; abdomen brownish. Fore wing white irrorated with black, the inner area tinged with ochreous; a short black streak below the base of costa; a long streak below median nervure and a short streak on median nervure; an antemedial black line running out to an acute angle to lower angle of cell, then interrupted; postmedial black streaks on subcostals and veins 6, 5, and 1; a double submarginal black line slightly excurved at middle. Hind wing ochreous white. Underside with a jet-black spot on base of costa of fore wing.

Hab. Aden (*Nurse*). *Exp.* 14 mm.

PHYCITA PHŒNICOCRASPIS, n. sp.

♂. Palpi with the second joint hollowed out to receive the maxillary palpi, which are triangular and flattened against the frons; antennæ with a sinus at base of shaft containing a ridge of large scales.

Head and thorax grey, irrorated with a few pink scales; abdomen white. Fore wing fuscous, thickly irrorated with white and pink scales; a white costal fascia thickly irrorated with pink from before middle to near apex; an ill-defined brown antemedial band; an indistinct medial line excurved at middle; a brown patch at lower angle of cell; a submarginal sinuous line with a brown patch on its inner side. Hind wing iridescent hyaline white, with fuscous marginal line and line through the cilia.

Hab. Aden (*Yerbury*). *Exp.* 20 mm.

Larva gregarious; yellow with black bands; much infested by Ichneumons; feeds on a prickly shrub.

PHYCITA POTERIELLA, Zell. Isis, 1846, p. 743.

Aden.

EPICROCIS (CANDIOPE) JOANNISELLA, Rag. Nouv. Gen. Phyc. p. 14; Mon. Phyc. pl. 10. f. 12.

Aden.

EPICROCIS (CANDIOPE) ERUBESCENS, n. sp. (Plate X. fig. 30.)

♂. Differs from *E. joannisella* in being suffused with pink. Fore wing with the first line more medial and with a dark patch before

it above inner margin, and a triangular diffused pale patch beyond it embracing the discocellular spot and without streaks on the veins; marginal band pink, with a series of dark marginal specks.

♀. Abdomen marked with brown and black; fore wing without the postmedial pale costal patch.

Hab. Aden (*Nurse*). *Exp.* ♂ 16, ♀ 18 mm.

Etiella zinckenella, Treit. Schmett. Eur. ix. p. 201.

Aden.

Pyralinæ.

Pyralis obsoletalis, Mann. Wien. ent. Mon. 1864, p. 179.

Aden.

Constantia vulgaris, Butl. P. Z. S. 1881, p. 621.

Shaik Othman, Arabia.

Constantia (Zonora) rufimarginalis, n. sp.

♂. Head and thorax pale red-brown and grey; abdomen pale. Fore wing pale red-brown irrorated with black, which is thickest on disc and before the postmedial minutely dentate white line, which is angled outwards on vein 6, then curved to vein 2; the outer area somewhat more rufous, with a diffused dark subapical spot and dark marginal line. Hind wing pale brown, suffused with fuscous.

Hab. Lahej, Arabia (*Nurse*). *Exp.* 20 mm.

Schœnobiinæ.

Thyridophora furia, Swinh. P. Z. S. 1884, p. 519, pl. 47. f. 13.

Aden.

Hydrocampinæ.

Aulacodes peribocalis, Wlk. xvii. p. 446.

Aden.

Duponchelia fovealis, Zell. Isis, 1847, p. 588.

Shaik Othman, Arabia.

Pyraustinæ.

Zinckenia fascialis, Cram. Pap. Exot. iv. pl. 398. f. O.

Aden; Shaik Othman, Arabia; Zaila, Somaliland.

Nacoleia vulgalis, Guen. Delt. & Pyr. p. 202, pl. 6. f. 8.

Lahej, Arabia.

Bocchoris onychinalis, Guen. Delt. & Pyr. p. 265, pl. 6. f. 9.

Aden.

Bocchoris inspersalis, Zell. Lep. Caffr. p. 33.
Desmia afflictalis, Guen. Delt. & Pyr. p. 191, pl. 5. f. 4.
Aden; Zaila, Somaliland.

Marasmia trapezalis, Guen. Delt. & Pyr. p. 200.
Lahej, Arabia; Zaila, Somaliland.

Pagyda traducalis, Zell. Lep. Caffr. p. 54.
Aden.

Glyphodes unionalis, Hübn. Eur. Schmett., Pyr. f. 132.
Margarodes transvisalis, Guen. Delt. & Pyr. p. 304.
Aden.

Glyphodes indica, Saund. Trans. Ent. Soc. 1851, p. 163.
Aden.

Hellula undalis, Fabr. Ent. Syst. iii. 2, p. 226.
Aden; Shaik Othman, Arabia.

Crocidolomia binotalis, Zell. Lep. Caffr. p. 65.
Shaik Othman and Lahej, Arabia.

Tegostoma comparalis, Hübn. Verz. p. 347.
Aden.

Tegostoma bipartalis, n. sp.

Head and thorax yellowish white, with brown stripe on vertex; abdomen pale fuscous. Fore wing very pale yellow, with diffused pale olive-brown stripes on basal half; the outer area leaden grey with a reddish suffusion, its inner edge oblique. Hind wing fuscous, with traces of broad darker marginal band.

Hab. Aden (*Yerbury*, *Nurse*). *Exp.* 14 mm.

Aporodes floralis, Hübn. Eur. Schmett., Pyr. f. 142.
Aden.

Aporodes albilinealis, n. sp. (Plate X. fig. 4.)

Grey-brown; abdomen whitish. Fore wing with straight erect medial white line; a discocellular white line with black speck on it at lower angle of cell and two white specks above it on costa; a submarginal white line angled outwards on vein 6, then incurved; a speck on costa near apex and marginal line. Hind wing whitish, with brown suffusion on apical area; a fine marginal dark line and line at base of cilia.

Hab. Aden (*Nurse*). *Exp.* 18 mm.

Mecyna polygonalis, Hübn. Schmett. Eur., Pyr. p. 409, pl. 4. f. 2.
Mecyna deprivalis, Wlk. xix. 806.
Shaik Othman, Arabia.

Noorda fessalis, Swinh. P. Z. S. 1886, p. 459, pl. 41. f. 13.
Aden.

Noorda blitealis, Wlk. xix. 979.
Aden.

Antigastra catalaunalis, Dup. Lép. Fr. viii. p. 330, pl. 232. f. 8.
Aden; Lahej, Arabia.

Nomophila noctuella, Schiff. Wien. Verz. p. 136.
Aden.

Pachyzancla mutualis, Zell. Lep. Caffr. p. 40.
Zaila, Somaliland.

Pyrausta arabica, Butl. P. Z. S. 1884, p. 500.
Aden.

Pyrausta phœnicealis, Hübn. Verz. p. 348.
Lahej, Arabia; Zaila, Somaliland.

Pyrausta incoloralis, Guen. Delt. & Pyr. p. 333.
Spilodes nitetisalis, Wlk. xviii. 773.
Aden; Shaik Othman, Arabia; Zaila, Somaliland.

Pyrausta pœdiusalis, Wlk. xviii. 788.
Aden.

Pyrausta inglorialis, Zell., ? MS.
Shaik Othman, Arabia.

Gen. Aplectropus, nov.

Palpi porrect, triangularly scaled, the 3rd joint hidden by hair; maxillary palpi filiform; frons rounded; antennæ of male ciliated; mid and hind tibiæ with the terminal spurs minute, the medial spurs absent. Fore wing short and broad, the apex rounded; veins 3, 4, 5 from angle of cell; 7 straight and well separated from 8, 9. Hind wing with veins 3, 4 from angle of cell; 5 from above angle; 6, 7 from upper angle, 7 anastomosing with 8 almost to apex.

Aplectropus leucopis, n. sp. (Plate X. fig. 10.)

Head, thorax, and abdomen black-brown, irrorated with grey; tarsi pure white. Fore wing reddish brown, irrorated and suffused with fuscous; a curved dark antemedial line; a prominent round white discocellular spot; a black line from costa near apex with white beyond it below apex, running out to the margin between

veins 5 and 2, then recurved almost to lower angle of cell, and with grey in the sinus. Hind wing fuscous, with rufous marginal band defined by a black line and narrowing to anal angle.

Hab. Aden (*Yerbury, Nurse*). *Exp.* 12–18 mm.

EURYCREON NUDALIS, Hübn. Samml. eur. Schmett., Pyr. f. 90.

Aden; Shaik Othman and Huswah, Arabia.

EURYCREON ALBIFASCIALIS, n. sp. (Plate X. fig. 29.)

♀. Head and thorax dark brown and grey with a cupreous tinge; abdomen white suffused with fuscous. Fore wing cupreous brown, irrorated with grey; a white fascia from base below median nervure and vein 2 to end of cell; a quadrate white spot in end of cell, with a series of three streaks beyond it, running obliquely to costa near apex; the outer margin pale. Hind wing white, suffused with pale fuscous and brown; a dark marginal line.

Hab. Aden (*Nurse*). *Exp.* 22 mm.

DOSARA PALMALIS, Swinh. P. Z. S. 1884, p. 525, pl. 48. f. 11.

Aden.

METASIA PROFANALIS, Wlk. xxxiv. 1403.

Aden.

LIMACODIDÆ.

PARASA FULVI-CORPUS, n. sp. (Plate X. fig. 12.)

♂. Head pale yellow; collar, patagia, and metathorax fringed with deep fulvous; thorax blue-green; abdomen pale yellow, dorsum deep fulvous. Fore wing blue-green, the costa pale yellow. Hind wing pale yellow.

Hab. Aden (*Nurse*). *Exp.* 22 mm.

LASIOCAMPIDÆ.

TARAGAMA ACACIÆ, Klug, Ehren. Symb. Phys. pl. ix.

Shaik Othman, Arabia.

COSSIDÆ.

EREMOCOSSUS PROLEUCA, n. sp. (Plate X. fig. 24.)

Head, thorax, and abdomen white with slight fuscous tinge. Fore wing brown, with broad white costal fascia hardly reaching apex; a white fascia from base of inner margin to middle of vein 1; an oblique white band from outer margin below apex, expanding into a large patch on disc, reaching middle of median nervure. Hind wing white.

Hab. Aden (*Yerbury, Nurse*). *Exp.* 22–32 mm.

The larva feeds on Acacia.

Sesiidæ.

Genus Crinipus, nov.

Palpi upturned and reaching vertex of head, the 2nd joint moderately fringed in front, the 3rd short; proboscis present; antennæ of male with minute fascicles of cilia; mid and hind tibiæ with medial and terminal tufts of hair; hind tarsi with the 1st joint tufted. Fore wing with veins 2 and 3 closely approximated from angle of cell; 4, 5, 6 at intervals; 7, 8 stalked. Hind wing with veins 3, 4 from angle of cell or shortly stalked; 5 absent; 6 from below upper angle.

Allied to *Aschistophleps* and *Oligophlebia*, Hmpsn.

Crinipus leucozonipus, n. sp. (Plate X. fig. 21.)

Head, thorax, and abdomen black; palpi in front, frons, and a line behind the eyes white; tibiæ, tarsi, and 4th segment of abdomen banded with white; some grey scales on 1st and last abdominal segments. Wings hyaline, the veins black; fore wing with black margins and discocellular band; both wings with the cilia brown.

Hab. Aden (*Yerbury*, *Nurse*). *Exp.* 14 mm.

Pterophoridæ.

Trichoptilus, Wlsm.

Trichoptilus oxydactylus, Wkr.

Pterophorus oxydactylus, Wkr. Cat. Lep. Ins. B. M. xxx. 944 (1864)[1].

Aciptilia oxydactyla, Wlsm. P. Z. S. 1885, p. 885 (1886)[2].

Pterophorus oxydactylus, Moore, Lep. Ceyl. iii. p. 528–9, pl. 209. 16 (1887)[3]; Swinh. & Cotes, Cat. Moths Ind. p. 669. no. 4549 (1889)[4].

[? = *Trichoptilus centetes*, Meyr. Tr. Ent. Soc. Lond. 1886, p. 16–17[5]; 1887, p. 266[6]; Wlsm. P. Z. S. 1891, p. 494–5 (1892)[7].]

Imago. 15 II.—9 III. (*Yerbury*, *Nurse*), IX.,[2] [? XI.[5]], XII.[2]

Hab. Ceylon[1,3]; India—Poona[3], Bombay[4]; S.W. Arabia—Aden (*Yerbury*, *Nurse*); Lahej (*Yerbury*, *Nurse*); [? New Guinea—Port Moresby[5]; ? Queensland[6]; ? West Indies—St. Vincent[7]].

Tortricidæ.

Olethreutinæ.

Pammene, Hb.

Pammene pharaonana, Kllr.

Grapholitha pharaonana, Kllr. Wien. ent. Monats. ii. p. 154–8, pl. v. 1–5 (1858)[1].

Grapholitha, sp., Frfld. Ver. z.-b. Ges. Wien, ix. Abh. p. 321–3, pl. vi. 1, pl. vii. 2 (1859)[2].

Grapholitha pharaonana, Ld.Wien. ent. Mon. iii. p. 339 (1859)[3]; iv. p. 157–8 (1860)[4].

Grapholita pharaonana, Wkr. Cat. Lep. Ins. B. M. xxvii. p. 266 (1863)[5].

Larva in galls on *Tamarix articulata*, XII.[1]

Imago. II.[1], 20 II. (*Yerbury*).

Hab. Egypt—Cairo[1], Alexandria[2]; S.W. Arabia—Shaik Othman (*Yerbury*).

The specimen collected by Col. Yerbury has the hind wings slightly darker than in Egyptian specimens.

Gelechiadæ.

Sitotroga, Hein.

Sitotroga cerealella, Oliv.

Sitotroga cerealella, Oliv.; Stgr. & Wk. Cat. 296, no. 2009 (1871).

Hab. Europe, N. America, Australia, Canaries. S.W. Arabia—Aden, 18 III. 1895 (*Nurse*).

Gelechia, Hb.

Gelechia molitor, Wlsm., sp. n.

Antennæ meal-white, faintly annulated.

Palpi somewhat flattened, closely clothed, recurved laterally to above the head; apical joint shorter than thes econd, gradually tapering but not slender; meal-white.

Head and *thoraæ* meal-white.

Fore wings elongate, lanceolate towards the apex; meal-white with some indication of a darker shade above the base of the fold, a slight greyish shade spot at the end of the cell and some very faint greyish shade spots around the termen at the base of the costal and terminal cilia, which are also meal-white. *Exp. al.* 14 mm.

Hind wings somewhat iridescent, greyish white; cilia mealy white.

Abdomen mealy whitish.

Legs mealy white.

Type, ♂.

Hab. Aden, 12 IV. 1895 (one specimen, *Nurse*).

Anarsia, Z.

Anarsia acaciæ, Wlsm., sp. n.

Antennæ greyish.

Palpi brownish fuscous externally, but with the anterior margin hoary white.

Head hoary whitish.

Thoraæ greyish.

Fore wings hoary greyish, with numerous short longitudinal streaks of greyish fuscous intermixed with lighter and darker shades of the ground-colour: of these the more conspicuous are

one at the base of the fold and one along the upper edge of the outer half of the fold, another at the lower edge of the discal cell beyond the middle, almost joining a more slender one beyond it, which nearly attains the termen; on the middle of the costa is a short oblique greyish-fuscous shade; cilia greyish, tending to ochreous along their base at the tornus, with slender darker lines running through them. Underside shining pale greyish; ♂ with a conspicuous tuft of jet-black hairs arising near the base of the dorsum. *Exp. al.* 13 mm.

Hind wings shining, somewhat iridescent, bluish grey; cilia greyish ochreous. Underside shining pale greyish.

Abdomen greyish, inclining to ochreous at the base.

Legs pale greyish ochreous, with faintly spotted hind tarsi.

Type, ♂ ♀.

Hab. S.W. Arabia—Aden (8 specimens, *Yerbury*, *Nurse*); Africa—Algeria (one specimen, *Coll. Ragonot*).

Larva in seed-pods of *Acacia edgworthii*—excl. 7-23. III. (*Yerbury*); *Acacia farnesiana* (*Ragonot* "No. 1137, Wlsm. 1894").

I first received an example of this species for examination from my late friend Monsieur E. Ragonot, who called my attention to the peculiar tuft of black hair-scales on the underside of the fore wing of the ♂. He had received it from Algeria bred from *Acacia farnesiana*, but I am not aware that he had published any description of it before his death, although I told him that I quite agreed with him in regarding it as a new species.

Elachistidæ.

Laverna, Crt.

LAVERNA GAMBIELLA, Wlsm.

Laverna gambiella, Wlsm. Tr. Ent. Soc. Lond. 1891, p. 117, pl. v. 54 (1891)[1].

Hab. W. Africa—Gambia[1]; S.W. Arabia—Aden, 12 IV. 1895 (*Nurse*).

Scythris, Hb.

=§ *Butalis*, Tr.

SCYTHRIS OCHREA, Wlsm., sp. n.

Antennæ pale ochreous.

Palpi pale brownish ochreous.

Head and *thorax* pale brownish ochreous.

Fore wings and *cilia* unicolorous pale brownish ochreous, the latter becoming slightly paler at the tornus.

Hind wings cinereous; cilia brownish ochreous. *Exp. al.* 13 mm.

Abdomen greyish.

Legs pale greyish ochreous.

Type, ♀.

Hab. Aden, 21 III. 1895 (two specimens, *Nurse*).

Allied to *Butalis subeburnea*, Wlsm.

Eretmocera, Z.

Eretmocera fasciata, Wlsm., sp. n.

Antennæ greyish fuscous.

Palpi dusky greyish.

Head and *thorax* bronzy greyish fuscous.

Fore wings bronzy greyish fuscous; with a straight, transverse, pale whitish ochreous fascia before the middle, followed by a dorsal spot before the tornus and a rather larger costal spot of the same colour before the commencement of the cilia; some faint whitish ochreous speckling on the wing-surface; cilia brownish grey, with a few æneous scales along their base. *Exp. al.* 9 mm.

Hind wings dark grey; cilia with a slightly brownish tinge.

Abdomen at the extreme base with a whitish ochreous band and a dark purplish patch below it, the remainder rich reddish orange; the anal segments dark purplish fuscous.

Legs dark purple, with pale whitish ochreous bands at the joints; spurs pale whitish ochreous.

Type, ♂.

Hab. Somaliland—Zaila, 2 VI. 1895 (*Nurse*); Arabia—Shaik Othman, 21 IV. 1895 (*Nurse*): two specimens.

Plutellidæ.

Plutella, Schrk.

Plutella cruciferarum, Z., Stgr. & Wk. Cat. pp. 281 & 425, no. 1626 (1871).

Hab. (cosmopolitan). S.W. Arabia—Aden, 12 IV. 1894 (*Nurse*).

Tineidæ.

Tineinæ.

Trichophaga, Rag.

Trichophaga swinhoei, Butl.

Tinea swinhoei, Butl. P. Z. S. 1884, p. 502–3 [1].

N. syn.=*Trichophaga coprobiella*, Rag. Ann. Soc. Ent. Fr. lxiii. p. 120–4, figg. (1894) [2].

Larva in hair-tubes in camels' dung, feeding on hair [2]; dogs' dung, 7 II.—23 II. (*Yerbury*).

Imago. *b*. I.[2], 24 II.—8 IV. (*Yerbury*).

Hab. N.E. Africa—Obok (Gulf of Tajurah) [2]; S.W. Arabia—Aden [1] (*Yerbury*), Little Aden (*Yerbury*), Shaik Othman (*Yerbury*).

Monsieur Ragonot created the genus *Trichophaga* to include the three species *tapetzella*, L., *abruptella*, Wlstn. (=*bipartitella*, Rag.), and *coprobiella*, making the latter the type. Some specimens received from Col. Yerbury, bred from larvæ feeding in the dung of dogs (and I am informed also in that of the hyæna) at Aden, caused me to compare *coprobiella* (of which I have a co-type) with

swinhoei, Btl. Their better condition proves them to be the same, and unites Ragonot's and Butler's names as synonyms. The habit of feeding on hair, which caused Ragonot to give it the name *Trichophaga*, is supported by additional evidence in the case of Col. Yerbury's larvæ, for the excrement is naturally charged with the hair of various animals forming the food of the dog or of the hyæna, and the tubes or cases formed by the larvæ, which project from the dry substance, are very similar to those which Ragonot received with his specimens. It would be curious to ascertain whether our common *T. tapetzella* has ever been found feeding in the dry casts of owls or in the excrement of cats or other animals, or forming tubes among these substances, where the conditions would be somewhat similar to those which conduce to this habit in the case of Butler's species. *T. tapetzella* has been observed in great abundance on palings in the neighbourhood of Brandon, where "furrier's waste" (the trimmings of rabbits' skins) is much used for manuring the fields, and where I have also taken *Monopis imella*, Hb., very commonly.

It is very remarkable that the peculiar neuration of *T. tapetzella*, a species described so long ago as 1758, should have remained unnoticed until the attention of my late friend was called to it in examining the structure of this African and Asiatic species. It seems to form a good generic distinction, at present including only three described species.

TRICHOPHAGA ABRUPTELLA, Wlstn.

Tinea abruptella, Wlstn. Ann. & Mag. N. H. (3 s.) i. 120 (1858)[1]; Wkr. Cat. Lp. Ins. B. M. xxx. 1003 (1864)[2].

Tinea bipartitella, Rag. Bull. Soc. Ent. Fr. 1892, p. lxxxii[3].

Tinea tapetzella, Rbl. Ann. k.-k. Hofmus. vii. 268-9, 283 (1893)[4]; ix. 17 (1894)[5].

Trichophaga bipartitella, Rag. Ann. Soc. Ent. Fr. lxiii. 122–4 (1894)[6].

Trichophaga abruptella, Wlsm. P. Z. S. 1894, 541[7].

Hab. Madeiras[4,5]—Porto Santo[1,2,4]; Canaries—Gran Canaria[4,5]; Tunis—Gabès[5,6]; Egypt[7]; Somaliland—Zaila, 21 V. 1895 (*Nurse*); S.W. Arabia—Aden, 30 IV. 1895 (*Nurse*).

TINEOLA, H.-S.

TINEOLA TÆNIÆCORNIS, Wlsm., sp. n.

Antennæ stout, flattened horizontally; pale ochreous.

Palpi pale ochreous.

Head brownish above; face rusty ochreous.

Thorax shining pale ochreous.

Fore wings shining pale ochreous; slightly darkened at the base of the costa; cilia the colour of the wings. *Exp. al.* 16 mm.

Hind wings greyish ochreous; cilia the same.

Type, ♂.

Hab. Aden, 14 III. (one specimen, *Yerbury*).

This species differs from all hitherto described species of *Tinéola* in the form of the antennæ, which are much stouter and more distinctly flattened than in *biselliella*, Humm., which it also exceeds in size. This form of antenna attains its greatest development in Ceylon.

PHTHOROPŒA, Wlsm., g. n.

(*φθοροποιός*=causing injury.)

Type. *Phthoropœa carpella*, Wlsm.

Antennæ less than the length of the fore wings, simple.

Labial palpi porrect, somewhat thickly clothed, apical joint concealed.

Maxillary palpi minute.

Haustellum apparently obsolete.

Ocelli ?

Head and *face* roughly clothed with projecting hair-scales.

Thorax smooth.

Fore wings elongate, somewhat lanceolate, costa straight, apex depressed. *Neuration* 11 veins (7 and 8 coincident), the rest separate; 9 and 10 almost anastomosed before the costa; the fork at the base of vein 1 apparently obsolete.

Hind wings almost 1, somewhat triangular, tapering to a narrow point, abdominal angle developed. *Neuration* 8 veins, all separate.

Legs: hind tibiæ somewhat hairy.

PHTHOROPŒA CARPELLA, Wlsm., sp. n.

Antennæ greyish ochreous.

Palpi brownish fuscous.

Head and *face* ferruginous.

Thorax bronzy fuscous, with two pale longitudinal streaks.

Fore wings bronzy brownish fuscous, with a paler streak along the dorsum and with three or four tufts of slightly raised scales showing a little darker than the ground-colour; the first on the middle of the fold with a smaller one above it on the disc, a second towards the end of the fold and another at the end of the cell; a dark fuscous line runs along the termen and another along the ends of the cilia, which have a tendency to give an uncate appearance to the apex. *Exp. al.* ♂ 12 mm., ♀ 16 mm.

Hind wings shining pale bronzy grey; the cilia, which are very long about the abdominal angle, are slightly paler. Underside shining bronzy grey, slightly paler than the fore wings.

Abdomen pale greyish ochreous, with two dark lateral spots at the base beneath.

Legs greyish ochreous, hind tarsi faintly speckled; anterior legs fuscous externally.

Type, ♂.

Hab. Aden (three specimens, *Yerbury, Nurse*).

Larva in fruit of *Solanum*, sp. (*Yerbury*); in seed-pods of *Acacia edgworthii* (*Nurse*).

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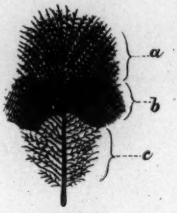

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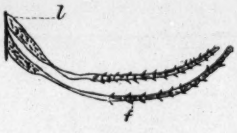

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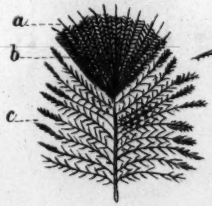

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METALLIC COLOURS OF TROCHILIDÆ AND NECTARINIIDÆ.

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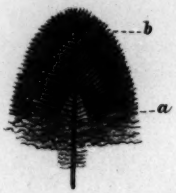

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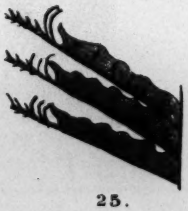

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METALLIC COLOURS OF TROCHILIDÆ AND NECTARINIIDÆ.

EXPLANATION OF PLATE X.

Fig. 1. *Hypætra leucoptera*, p. 264.
2. *Emmiltis nigrescens*, p. 267.
3. *Ephyra rufistrigata*, p. 267.
4. *Aporodes albilinealis*, p. 274.
5. *Crambus leucozonellus*, p. 269.
6. *Eublemma ecthæmata*, p. 262.
7. *Nephopteryx metamelana*, p. 271.
8. *Heliothis pictifascia*, p. 259.
9. *Xanthoptera mesozona*, p. 261.
10. *Aplectropus leucopis*, p. 275.
11. *Metachrostis atribasalis*, p. 261.
12. *Parasa fulvi-corpus*, p. 276.
13. Pupa of *Teracolus phisadia*, pp. 245, 252.
14. Pupa of *Teracolus yerburii*, pp. 246, 254.
15. Pupa of *Teracolus protomedia*, p. 256.
16. *Iolaus nursei*, ♂, p. 251.
17. Pupa of *Teracolus halimede*, pp. 246, 253.
18. Pupa of *Teracolus pleione*, p. 245.
19. *Eublemma seminivea*, p. 262.
20. *Acidaliastis micra*, p. 267.
21. *Crinipus leucozonipus*, p. 277.
22. *Nephopteryx nigristriata*, p. 272.
23. *Archinola pyralidia*, p. 259.
24. *Eremocossus proleuca*, p. 276.
25. *Spilosoma arabicum*, p. 258.
26. *Pseudaglossa fumosa*, p. 266.
27. *Nemoria pulvereisparsa*, p. 268.
28. *Eromene pavonialis*, p. 269.
29. *Eurycreon albifascialis*, p. 276.
30. *Epicrocis erubescens*, p. 272.
31. *Pseudophia ochribasalis*, p. 264.

3. Observations on the Metallic Colours of the *Trochilidæ* and the *Nectariniidæ*. By Miss Marion I. Newbigin, B.Sc.[1]

[Received January 13, 1896.]

(Plates XI. & XII.)

The metallic colours of birds form a subject of great interest, and one, moreover, which has not yet been fully investigated. The great interest of the subject lies in the fact that metallic colour in birds is often almost entirely confined to the male sex. If the colours and ornaments of the male sex are, as Wallace and others have maintained, an expression of his greater "vitality and growth-power," it may reasonably be asked why this vitality should so frequently express itself in structural colour, which can hardly be supposed to have much physiological importance. Although the present paper does not profess to attack the problem of the origin in the physiological processes of the individual of these colours, yet it is hoped that some of the points discussed may ultimately prove of service in the solution of this problem.

The families of the Humming-birds and Sun-birds were chosen for two reasons. In the first place, both families include species or genera exhibiting metallic colouring of extraordinary brilliancy, and also other genera and species which are devoid of all metallic colouring. In the second place, the two families present marked, if superficial, points of resemblance, although systematists are all agreed in separating them very widely. On this account it was thought that a detailed comparison of their colouring would disclose facts of interest.

[1] Communicated by F. E. Beddard, F.R.S.

First, as to the distribution of metallic colours in the two families.—In the Sun-birds, the metallic tints are usually, though not invariably, confined to the male sex, and this in spite of the fact that the nests are domed. In the male, brilliant patches of colour frequently occur on the upper surface of the head and on the throat. Rather less frequently the contour-feathers of both the upper and lower surface show metallic tints (e. g., *Nectarinia famosa*). On the other hand the rectrices very frequently show a longitudinal band of colour, or, more rarely, the central two may be wholly metallic (e. g., *Æthopyga seheriæ*). The tail-coverts are frequently metallic, the wing-coverts only rarely so, and the wing-quills hardly ever show any metallic colouring. Thus, in general, the metallic tints occur on the feathers in two ways. There may be a broad transverse band of metallic colour occupying the whole of the visible part of the feather; this occurs especially on the head and throat, more rarely on the general contour-feathers. Again, the metallic tinting may occur as a longitudinal band of varying width at the edges of the feather; this is especially seen in the rectrices, more rarely in the case of the greater wing-coverts. In some cases these longitudinal bands may become so much widened as to occupy the whole of the feather: this seems only to occur in the central rectrices.

As to the range of metallic colour in Sun-birds, it is readily seen that the commonest metallic colours are green, blue, and violet; a reddish violet is more uncommon, and a pure bronze-red and a golden yellow seem both to be absent. This last point is of interest in view of the fact that red and yellow (lipochrome) pigments are very widely spread in the family.

In Humming-birds metallic tints occur in both sexes, but are usually more brilliant in the male. They very frequently occur on the general contour-feathers, the colour being then often a bronze-green, which is not sharply confined to a transverse band, but fades away gradually behind. The metallic colours which are especially characteristic of Humming-birds, however, occur, as is well known, in patches of extraordinary brilliancy either on the head as a crest, or on the lower surface, especially of the throat. The feathers forming these patches are peculiarly modified, and may display any of the colours of the spectrum including ruby-red and golden-yellow—the colours which are so markedly absent from the metallic feathers of Sun-birds. The rectrices of Humming-birds not infrequently display metallic colour, which may be distributed over the whole feather or may be limited to a transverse band near the tip. Longitudinal bands of metallic colour such as those of the Sun-birds do not seem to occur.

Pigmental colours among Humming-birds are not remarkable for brightness of tint, being usually shades of grey or dull brown. The only marked exception is the colour called by systematists "rich chestnut" or "cinnamon," which is often limited to the males, as for example in *Eustephanus fernandensis* ♂. In this connection it may be noticed that not only are metallic tints

almost invariably absent from the wings, but where, as in the above species, the male as compared with the female is characterized by the development of a special pigmental colour, this pigment is entirely absent from the wing-quills, though present in the wing-coverts.

Having thus described some of the special peculiarities of distribution of the metallic tints of the two families, it may be well to consider what is known as to this kind of colouring. The most important paper is that of Gadow ("The Coloration of Feathers as affected by Structure," Proc. Zool. Soc. 1882, pp. 409–421, 2 pls.; see also Bronn's 'Thierreich,' Bd. vi. Abt. iv. S. 575–584); but more recently there has been published a research from the physicist's standpoint ('Die Oberflächen- oder Schillerfarben,' von B. Walter: Braunschweig, vi+122 pp., 8 figs., 1 pl., 1895). Gadow distinguishes metallic colours as *subjective*, and thus contrasted with *objective* unchanging structural colours such as the green of many Parrots' feathers. He examined numerous feathers showing metallic colour, and found that all looked black when the eye was placed in the plane of the feather between the light and the feather, and also when the feather was placed under a similar condition between the eye and the light. In intermediate positions certain of the colours of the spectrum could be observed in the order in which they appear in the spectrum. Thus a feather which when looked at from above is green, when successively moved through the positions named above, shows the colours black, green, blue, violet, black; while a red feather would usually show a greater, and a blue a less range of colour. Further, on examining certain metallic feathers microscopically, Gadow found that "in any metallic feather the metallic colour is confined to the radii which are entirely devoid of cilia, and consist of a series of variously shaped compartments which overlap one another like the tiles of a roof."[1] The direct physical cause of the colour Gadow considers to be the transparent sheath of keratin which covers the compartments, and which according to him acts like a series of prisms. Such metallic radii always contain blackish-brown pigment (melanin).

Gadow's theory that the metallic colour of birds' feathers is due to the dispersion of white light by prisms is strongly opposed by Walter (*op. cit.*) on physical grounds. Walter holds that all the structural colours of animals are "Schillerfarben." He does not appear to distinguish between Gadow's subjective and objective colours, but compares the pigments of the coloured tissues to such colouring-matters as fuchsin and "diamond-green." This analogy hardly seems to be compatible with our present knowledge of the melanin pigments in birds, but the question is not one which directly affects the present discussion.

Returning to Gadow's description of metallic feathers, it is obvious that if the type described by him is of universal occurrence,

[1] A similar statement in the article "Colour" in Newton's 'Dictionary of Birds' is qualified by the words "as a rule," but no details are given.

then metallic quill-feathers must be useless for purposes of flight. Owing to the absence of cilia, the barbules are wholly unconnected, and so can offer little resistance to the air. The unconnected nature of the barbules may frequently be observed in metallic feathers by the unaided eye, *e. g.*, in the feathers of the Peacock. In confirmation of the belief that such metallic feathers must be useless for purposes of flight, we find that the long metallic feathers of the Peacock or Quezal are not the tail-quills, but merely the tail-coverts, and that the wing-quills in both cases are non-metallic. While endeavouring to continue this chain of reasoning, however, the writer was struck by the fact that in Humming-birds, where the power of flight is so marked, not only are the rectrices frequently metallic, but they displayed a closeness of texture which seemed incompatible with Gadow's statement that ciliæ are always absent from the radii of metallic feathers. The metallic feathers of Sun-birds, on the other hand, show always a certain looseness of texture as compared with the non-metallic. On examining the respective feathers of Sun-birds and Humming-birds microscopically, it was found that marked differences exist between them.

We will first describe a purple metallic feather of the Sun-bird *Cinnyris amethystina*. When examined by the unaided eye (Pl. XI. fig. 1), this feather is seen to be divided into three regions. There is a distinct terminal band of metallic colour, distinguishable by its deep pigmentation and peculiar structure. Next we have a band of close texture and brown colour, which has an indentation at its lower end. Finally, the base of the feather is of an ashy colour and downy structure. The basal indentation of the brown band possesses some interest, because Darwin ('Descent of Man,' 2nd edition, p. 430 *et seq.*) regarded a similar indentation in the centre of the ocellus of the Peacock as evidence of its origin from two confluent ocelli.

It is possible to obtain from the feather described a single barb which bears barbules belonging to each of the three regions: in this way transition forms can be very readily seen.

The basal barbules exhibit the usual structure of downy barbules, that is to say the distal portion, which from its (apparent) shape may be called the lamina, is more or less rudimentary, while the distal or filamentous region is greatly elongated and very slender, has only rudimentary ciliæ, and consists of a series of joints slightly overlapping one another (Pl. XI. fig. 2).

The barbules of the middle region possess a well-developed lamina and a long filamentous region furnished with cilia and, in the case of the distal barbules, with distinct hamuli (Pl. XI. fig. 3).

The barbules of the metallic region are metamorphosed into short, wide, club-shaped bodies, supported on broad stalks (Pl. XI. fig. 4). These clubs are deeply pigmented with brown, and show very distinctly transverse bars—the compartments of Gadow. Although to the unaided eye the transition between the metallic and the non-metallic barbules is abrupt, yet microscopically it is sufficiently

gradual to show that the stalk of the metallic barbule is the rudimentary lamina, and the club-shaped body a modification of the distal region of an ordinary barbule. As was observed by Gadow, the cilia are totally suppressed.

To contrast with this feather, we may take one from the brilliant green gorget of the Humming-bird *Basilinna leucotis* (Pl. XI. fig. 7). Such a feather is comparatively short, and the especial brilliancy is confined to a darkly pigmented apical band. The apex of the feather is very abruptly rounded and the barbs are closely connected so as to give a plate-like or scaly appearance. The surface is strongly marked with furrows, which when examined with a lens are seen to correspond to the barbs, each of which lies as it were at the bottom of a trough. The sides of this trough are formed by the two rows of barbules, which are inserted at a distinct angle. The sides of the trough have an unequal slope, as the proximal barbules are inserted at a larger angle than the distal. A further point of interest is that the naked barbs are prolonged beyond the apex of the feather, producing the appearance of a very delicate fringe. This prolongation of the naked barb was noticed many years ago (see the Introduction to Gould's Monograph of the Humming-birds), and its meaning will be explained later on.

Examined microscopically, the downy barbules of this feather show nothing particularly worthy of notice. The remaining barbules have all a well-developed lamina, and a distal region usually well provided with cilia. Those nearest the apex of the barb, that is those which are very brilliantly metallic, are very darkly pigmented (Pl. XI. fig. 9). Those near the base of the upper barbs are much less strongly pigmented, and show very little metallic colour. Between the two extremes there are also other marked differences (Pl. XI. figs. 8 and 9). Thus in the basal barbules there is no marked angle between the proximal flattened region and the distal cilia-bearing region. In the apical barbules the proximal region is widened and has a well-marked infolding, while the distal region is inclined to it at such an angle as to be almost invisible in surface view (Pl. XI. fig. 10).

Microscopically, the naked tip of the barb is seen to be furnished with rudiments of barbules.

As this type of metallic feather occurs in all the Humming-birds of which the feathers were examined, it is obvious that Gadow's statement that all metallic barbules are devoid of cilia is too universal. It is certainly true for a great number of cases (Sun-birds, Peacock, &c.), because in these it is the region which ordinarily bears the cilia—the distal or filamentous region—which is modified into the colour-producing structure, and in the course of the modification the cilia are lost. In the Humming-birds, on the other hand, it is the proximal region of the barbule which is the colour-producing structure, and in consequence the filamentous region is not affected and may bear cilia as usual. In the feather described above, the cilia are exceedingly well-developed in the metallic barbules.

Though this paper is not concerned with the physical cause of

colour, it may be noticed as a fact for future investigators that, as is indicated in the figures, the laminæ in the feather described show more or less distinctly an arrangement of cross-bars (or compartments). This is common in the case of the Humming-birds, but it is also sometimes distinctly visible in the laminæ of the barbules of Sun-birds (see Pl. XI. fig. 3 and Pl. XII. fig. 18), so that its significance is somewhat doubtful. One other fact in connection with the metallic colour may be noted. Contrary to the usual rule, the feather of the Humming-bird mentioned under certain circumstances exhibits metallic tints by transmitted light even under ¼" objective. When this occurs, it is clearly seen that the colour is confined to the dark infolded part of the barbule, which alone under ordinary circumstances is visible (see Pl. XI. fig. 10). This infolded part cannot, however, be itself the cause of the metallic colour, for it is absent from the metallic feathers in some cases (see Pl. XII. fig. 19).

The ridging of the surface of the feather produced by the way in which the barbules are inserted, though apparently a factor in colour production, cannot be absolutely essential, for it is sometimes absent. Thus, in *Calothorax lucifer* in the brilliant throat-patch the feathers in the middle line are very distinctly ridged and have the usual plate-like structure, while those at the sides of the throat are quite devoid of ridges but do not show diminished brightness. Similarly, in *Cyanolesbia gorgo* the brilliant green feathers of the crest are perfectly smooth, and have a certain hard gloss which is absent in the ridged feathers.

The fact that in Humming-birds it is the proximal, and in Sun-birds the distal region of the barbules which is metallic has more effect upon the general coloration than might at first sight be supposed. It is, in the first place, now obvious that there is nothing in the structure of the metallic feathers of Humming-birds which is likely to affect their efficiency even in quill-feathers. We can thus understand how it is that many of the tail-quills in Humming-birds, and even the wing-quills in *Eulampis jugularis*, may exhibit metallic colour and yet perform their usual function. But this is not the only effect produced by the difference. In Sun-birds the lamina is rudimentary in the metallic barbules; now the lamina tends to become rudimentary in the barbules at the bases of the barbs, that is in downy barbules, and in the barbules at the apices of the barbs. Downy barbules never seem to show a tendency to become metallic, and we thus find that in Sun-birds the metallic barbules occur only at the ends of the barbs. A little reflection will show that the consequence of this is, that the metallic barbules will form a transverse band on contour-feathers, where the ends of the barbs stand much on the same level, and a longitudinal band on quill-feathers where the rachis is much elongated. The position of the bands of metallic colour on the feathers of Sun-birds is thus a consequence of the kind of modification to which their metallic barbules are subject. (See Pl. XI. fig. 1 and Pl. XII. fig. 17.)

In Humming-birds there is an almost complete reversal of this state of affairs. In them the metallic barbules have an extremely

well-developed lamina; therefore in this case metallic barbules can occur only towards the middle of the barb in contour-feathers, for this is the only place where the lamina is well-developed. In other words, in contour-feathers the metallic band cannot be, or is not primitively, terminal. Where it seems to be terminal, as in the feather described above, this is accomplished by a total or partial suppression of the terminal barbules, the naked barb persisting and forming the delicate fringe already noticed. This does not, however, occur in quill-feathers to the same extent, because these as a rule are characterized throughout by having barbules with very well-developed laminæ. Thus it is by no means uncommon to find terminal bands of metallic colour in the tail-quills of Humming-birds, or we may find the whole surface metallic: there never seems to be a longitudinal edging of metallic colour.

Conviction as to the truth of the statement here made, that metallic bands on the contour-feathers of Humming-birds are not primitively terminal, is best attained by considering a series of cases.

In *Eustephanus galeritus*, female, the breast is covered with greyish feathers which have near their centre a spot of brownish pigment which shows a faint metallic-green sheen. In the breast-feathers of *E. fernandensis*, female, undoubtedly a more specialized species, the spots are not much larger but the pigmentation is darker, and the metallic colour is much more brilliant. This kind of metallic colouring is very frequent, especially among the females of many species or genera (*cf.* the species of the genus *Oreotrochilus*). If the barb of such a feather is examined microscopically, it is seen that all the barbules with well-developed laminæ contain pigment and are metallic. Towards the base of the barb the barbules are colourless and downy, towards its apex they are colourless and short, the lamina is rudimentary, the filamentous portion is somewhat expanded and bears only rudimentary cilia (Pl. XI. fig. 11). Between this type and that of the gorget-feathers of *Basilinna leucotis* (Pl. XI. fig. 12) there are all stages in the suppression of these apical barbules. Thus in *Eustephanus fernandensis*, female, itself the feathers of the posterior region of the back are brilliant green, but are quite distinctly tipped with white. In the specialized crest which this female is almost peculiar in possessing this white edging is much reduced, but the colourless apical barbules are still quite visible with a lens.

In general, we may say that while the feathers of the specially brilliant patches have barbs with naked tips, the ordinary metallic contour-features have barbs which bear at their tips a series of non-metallic barbules. Thus the green feathers on the back even of *Basilinna leucotis* have a distinct border of pale rufous colour. This is of some interest from the point of view of the development of the metallic colours of Humming-birds. In *Phaethornis eurynome*, one of the so-called 'hermit' forms without any brilliancy of colour, the feathers of the back are greyish black edged with a broad band of yellowish colour; the dark region exhibits a very faint greenish sheen. If we begin with a type like this, the evolu-

tion of the ordinary metallic contour-feathers of most Humming-birds has been accompanied by a reduction of this terminal band in width and in the individual barbules forming it, a large increase of pigment in the laminæ of the barbules forming the blackish-grey part of the feather in *Phaethornis*, and a specialization of the barbules of this region, of which the most obvious result is the shortening of the filamentous portion and its inclination to the lamina. In the feathers of the patches of especial brilliancy these changes have been carried further, and have been accompanied by a shortening of the feather and rounding of its tip, and a change in the angle of insertion of the barbules. The changes in the wing-quills seem to have been of a simpler description, and to have been chiefly accompanied by a specialization of the lamina.

As to the meaning to the individual of this progressive change, one suggestion may be hazarded. The Humming-birds are especially characterized by their power of flight. Now of the many correlated variations which must occur during the gradual improvement of the power of flight, an increased development of the lamina and of cilia and hooklets is likely to be important. It is therefore perhaps not unreasonable to suppose that the metallic colours of Humming-birds are due to a persistence in the same line of variation which produced their powers of flight. If Kölliker ("Die Entstehung des Pigments," Zeitsch. f. wiss. Zool. vol. xlv.) is right in his belief that the formation of pigment is connected with the blood-system, it is quite comprehensible that an increase in structural specialization should be accompanied by an increase in the amount of pigment. It might be objected that the Swifts, which are probably nearly allied to the Humming-birds, have also great powers of flight and yet do not show metallic colours. In reply to this objection, it may be said that it is generally admitted that Humming-birds have few enemies, and that therefore variations might occur in them unchecked which would possibly lead to elimination in other forms. A more important objection is that the wings do not usually show metallic colour: it seems impossible to suggest a reason for this beyond the simple fact that the wings seem to be slow to vary in colour. It will be noticed that, in the especially brilliant patches, the extreme closeness of the connection between the adjacent barbs is a variation in the direction of the ordinary condition of the feathers of flight.

The course of the development of metallic tints in Sun-birds offers many points of contrast to that just described for Humming-birds. If we take (Pl. XII. fig. 22) one of the ordinary contour-feathers of a non-metallic form, such as a female of a species of *Cinnyris*, probably *C. jugularis*, it will be found that it presents considerable resemblance to a corresponding feather from a "hermit" Humming-bird. Thus it consists of a basal downy region, a mid-region pigmented with brownish black, and an apical region with disconnected diverging barbs, usually of a dull olive colour. Beginning with such a feather, the development of metallic colour is accompanied by an increasing predominance and pigmentation of

this apical band, until such a metallic feather as that of fig. 1 is produced. The course of development of the metallic edging of quill-feathers may be described in a little more detail. In order to illustrate this, it may be convenient to describe in a concrete example the differences between the sexes in the coloration of wings and tail. The following notes were made on a female of *Anthreptes malaccensis* and a male in nearly completed moult, but the characters of the adult male were checked by reference to Shelley's 'Monograph of the Sun-birds.' In the male the tail was composed of black feathers with an edging of metallic violet, which was widest in the case of the two central feathers. In the wings the lesser wing-coverts had a broad *transverse* band of metallic violet, the median coverts a similar band of dark brown, and the greater coverts a *longitudinal* band of olive-yellow, which becomes brown in a completely adult male. The wing-quills themselves were greyish brown with olive edges. In the female the tail was dark brown with an edging of olive-yellow. The wing-quills and wing-coverts were ashy grey with longitudinal or transverse bands of olive-yellow distributed in the same way as in the male. In the female the general contour-feathers had a broad transverse band of olive-yellow, while in the male most of these feathers had been replaced by others with transverse metallic bands. It must be noted that in all these cases the olive-yellow part of the feather has a peculiar looseness of structure visible even to the unaided eye. It should also be observed that the yellow edging to the quills is seen both in the rectrices and remiges of the female in this as in numerous other Sun-birds, while in the male the edging is replaced in the case of the rectrices by a metallic band. The respective distributions of longitudinal and transverse bands should be especially noticed, as showing how very closely the nature of the stripe depends upon the nature of the feather, that is upon its elongation.

From the above description it is obvious that some sort of relation exists between the olive-yellow margins of the feathers of the female and the metallic margins of the feathers of the male. In general, we may say that there is a tendency for the feathers with olive margins in the female to be replaced by feathers with metallic margins in the male. It will be noticed that the change is associated with increased pigmentation in the male; in the median wing-coverts there is only slightly increased pigmentation without metallic colour. Such a tendency is very widely spread in the family, but the extent of replacement differs greatly. Thus in the species described above the olive edging of the greater wing-coverts and wing-quills is not replaced by a metallic edging in the male. In *Nectarinia famosa* an olive edging in the same feathers in the female is replaced in the male by a metallic edging. In *Anthrobaphes violacea* the tail-coverts are edged with yellow in the female and in most males: according to Shelley, some males as an individual variation have this edging metallic. It is, however, needless to multiply examples. Enough has been said to justify

the main contention of the relation between the two kinds of feather-edging in Sun-birds.

Microscopic examination shows that this analogy is not purely superficial. Pl. XI. fig. 15 represents three barbules from the yellow edging of a wing-quill of *Æthopyga seheriæ*, and Pl. XI. fig. 16 three faintly metallic barbules from the border of the tail-quill of *Anthreptes malaccensis* (? represented in Pl. XII. fig. 18). With these should be compared the brilliantly metallic barbules from the tail-quill of *Æthopyga seheriæ* (Pl. XII. fig. 20). Similarly the barbules from the olive tip of a contour-feather of a species of *Cinnyris* (Pl. XII. fig. 24) should be compared with the metallic barbules of *Cinnyris amethystina* (fig. 5 or 14)[1]. These figures show that the barbules of the yellow edging of contour-feathers or quills agree with metallic barbules in having a rudimentary lamina and suppressed cilia, and in distinctly showing a system of overlapping compartments. They differ from the true metallic barbules in the absence of the great flattening visible in these, and in the want of a considerable amount of dark pigment. From the faintly metallic barbules of *Anthreptes* they seem to differ only in the absence of pigment. The yellow colouring, at least in the case of contour-feathers, is confined to the barbs, the barbules are only very faintly pigmented with grey. The metallic colouring of the Sun-birds is thus the result of an accentuation of a type of feather-structure widely spread in the family. I have noticed this occurrence of much modified barbules apart from metallic colour also in the male Pheasant (*Phasianus colchicus*). Some of the long tail-quills have here a very distinct longitudinal edging of brownish colour and loose texture. Examined microscopically, the barbules of this region show distinctly the "metallic" structure although there is no visible metallic colour. Similarly the chestnut feathers of the breast have a very distinct line across them, the distal region having a somewhat burnished surface, and terminating finally in a dark green metallic tip. Examined microscopically the barbules of the distal region show distinctly the "metallic" structure, and except for the absence of black pigment seem to differ little from the green metallic barbules. The modification is probably a common one, and Pl. XI. fig. 13 shows that it is even suggested in the Humming-birds, though in this case it does not appear to develop further.

Gadow notices that metallic colour appears only on the exposed parts of feathers; apparently the "metallic" modification also occurs only on the exposed parts of feathers near the apices of the barbs.

One of the most striking features of the coloration of the Sun-birds is the almost universal absence of metallic colour from the wing-quills, even though these sometimes have an edging of loose structure. In *Cinnyris auriceps*, according to Shelley, the wing-quills of the female have olive edgings which are absent in the male. It seems reasonable to suppose that a tendency to variation

[1] See also some of Gadow's figures, *e. g.*, of a red barbule of *Æthopyga*; no allusion, however, is made to these in the text.

in the wing-quills in the direction of diminished efficiency for flight would be checked by natural selection.

So far we have seen how the metallic colours both of Sun-birds and Humming-birds depend in each case upon a combination of a certain structure and a black pigment. In conclusion something may be said as to the colours themselves. In the Sun-birds a greenish-blue seems to be the most primitive metallic colour, and this is a very common tint elsewhere, *e. g.* Peacock, Quezal, &c. According to Gadow, one of the reasons why any metallic feather does not display all the colours of the spectrum is probably because the overlapping of successive colour-producing structures cuts out certain of the rays. If this overlapping really occurs it seems not unnatural to conclude that the middle rays of the spectrum, those in the neighbourhood of the green, would be least likely to be affected, and we would thus get green as a primitive metallic colour. The combination of this structure with a surface sculpturing might produce a purple or violet tint; the absence of red and yellow may not improbably be a result of physical conditions. Walter explains the rarity of red and yellow metallic colours as due to the nature of the pigments contained in the coloured tissues, but this again is difficult to harmonize with our knowledge of such pigments.

There can be little doubt that in Humming-birds a greenish-yellow is the most primitive metallic tint. It is suggested even in the "hermit" forms, and is very widely spread on contour-feathers elsewhere. In the absence, however, of any suggested physical explanation of the metallic colours of Humming-birds, it would perhaps be premature to attempt to account for the wonderful range of colour found in the family. As to the distribution of metallic colour one or two facts still remain to be noticed. Thus metallic colour is not always characteristic of the male. In *Eustephanus fernandensis* female metallic colour is more or less distinctly present over nearly the whole of the upper and under surfaces, the tail-quills show bright metallic colour, and the head bears a special metallic crest. The male, on the other hand, has no metallic colour except the bright crest, the rest of the body is cinnamon-coloured and without metallic gloss. The absence of metallic colour is apparently to be accounted for here by the absence of the usual blackish-brown pigment. Again, a specimen marked *Topaza pella*, young male, which was examined, showed metallic-greenish feathers in the upper part of the head, a spot which in the adult is covered with black feathers. Similarly, Salvin notices that in *Lampornis mango* the throat in the young bird is covered with glittering green feathers, and in the adult with pure black ones. Thus apparently an excess of black pigment is as fatal to the display of metallic colour as its total absence. As to the relation between a black colour and metallic tints there are some other interesting facts. In *Cyanolesbia gorgo* the tail-quills are greatly elongated and show gorgeous metallic colour, but this is confined to the distal end of the feathers, the proximal region being a

velvety black. The black region extends further up the vane on one side of the rachis than on the other. In mounted specimens the overlapping of the quills occurs in such a manner that the successive feathers cover over the black region of the feathers in front. There seems to be no difference in the amount of pigment present in the two regions. Remembering the, as yet, unexplained fact that metallic colours occur only on exposed parts of feathers, it seems impossible to doubt that the black region is associated with the overlapping of the feathers. The tail is forked, and in consequence it is hardly probable that the rectrices can be separated and spread out to form the "parachute"-like structure which has been described in other forms; the black area is thus permanently covered up.

In *Sappho sparganura* the conditions are almost reversed, the exposed parts of the tail-quills are brilliantly metallic, with a band of black at the apex. It seems most probable that in this case, as in *Topaza pella*, the black colour is produced by an excess of melanin pigment.

Summary.—From the account given above it is seen that in the metallic feathers of Sun-birds the radii are without cilia and their distal regions are more or less completely modified into flattened club-shaped bodies containing a large amount of brownish pigment, and consisting of a series of "overlapping compartments," as described by Gadow. It is also seen, however, that the barbules near the apices of the barbs tend throughout this family to become modified in this way, so that the distinction between male and female, or specialized and unspecialized forms, is less in the structure of the barbules than in the amount of brownish pigment present. From the fact that similar conditions are observed in the Pheasant it seems probable that this occurs not infrequently.

In the case of the Humming-birds the metallic colour is confined, like the brownish pigment, to the proximal part of the barbules, and its presence is not associated with any modification of the barbules which affects their efficiency in the feathers of flight. In their case, therefore, metallic colours may occur in the quills of the tail or (rarely) wing without interfering with the powers of flight. Further, as the metallic colour is associated with a specialization of the proximal region of the barbule, it cannot in contour-feathers primitively form a terminal band; the apparently terminal position is produced by the gradual suppression of the apical barbules, in which the proximal region is never well-developed.

The examination of specimens upon which this paper is based was chiefly carried on in the Museum of Science and Art, Edinburgh, and I have to record my obligations especially to Mr. Eagle Clarke for his kindness in affording me facilities for doing so, and especially for furnishing me with several feathers for microscopic investigation.

The systematic part of the paper is based on Shelley's 'Monograph of the Sun-birds' (London, 1876–80), and Salvin's Catalogue of Humming-birds (B. M. Catalogue of Birds, vol. xvi. 1892).

EXPLANATION OF PLATES XI. & XII.

Fig. 1. Violet metallic feather of *Cinnyris amethystina*, showing three zones: *a*=apical metallic zone; *b*=brown pigmented zone with closely connected barbules and basal indentation; *c*=downy basal zone.

Fig. 2. Two downy barbules from same: *l*=rudimentary lamina; *f*=filamentous region, much elongated and with rudimentary ciliæ. Objective ⅛", Ocular B.

Fig. 3. Proximal radius from region *b* of same, showing well-developed lamina, slightly pigmented and marked with cross-bars, and filamentous region with well-developed cilia. Ob. ⅛", Oc. B.

Fig. 4. Proximal radius of same, showing transition to metallic condition. The lamina is rudimentary, and the filamentous region is pigmented and somewhat expanded. Ob. ⅛", Oc. B.

Fig. 5. Metallic radius of same, showing shape, compartments, and peculiar flattening. The last three figures are all of radii taken from different levels on the same barb.

Fig. 6. Fragment of metallic barb under low power, to show position of barbules: *p*=proximal radii; *d*=distal. Ob. 1", Oc. B.

Fig. 7. Metallic feather from gorget of *Basilinna leucotis*: *a*=naked barbs, corresponding to zone *a* of fig. 1; *b*=metallic region of feather, corresponding to zone *b* of fig. 1; *c*=downy region. 7 *a* is a diagrammatic cross-section of a single barb, to illustrate the formation of the surface-ridges of the feather: *d*=distal radius; *p*=proximal radius; *b*=barb.

Fig. 8. Proximal radius from the base of one of the metallic barbs of above feather. The lamina is only faintly pigmented. Ob. ⅛", Oc. B.

Fig. 9. Distal radius from brilliantly metallic region of same. The lamina is deeply pigmented and has a folded-in edge. The filament is without pigment. Ob. ⅛", Oc. B.

Fig. 10. Fragment of metallic barb of same with distal barbules only, to illustrate normal position of barbules. Owing to the angle of insertion of the filamentous region, this is not visible in surface view. Ob. ⅛", Oc. B.

Fig. 11. Tip of barb of breast-feather of *Eustephanus fernandensis* ♀, to illustrate apical modification of barbules. The lower barbules in the figure are metallic. Ob. 1", Oc. B.

Fig. 12. Tip of barb of gorget-feather of *Basilinna leucotis*, with naked barb furnished only with rudiments of apical barbules. Ob. 1", Oc. B.

Fig. 13. Barbules from three different levels on a barb of a contour-feather of *Phaethornis eurynome* to show details of the modification of the original apical barbules. Note in passing towards the apex of the barb the reduction of the lamina and flattening of filamentous region. The filamentous region is, however, unpigmented. Ob. ⅛", Oc. B.

Fig. 14. Fragment of barb of *Cinnyris amethystina* for comparison, and to show junction of metallic and non-metallic regions. Ob. 1", Oc. B.

Fig. 15. Three barbules from the yellow edging to a quill of *Æthopyga seheriæ*. Ob. ⅛", Oc. B.

Fig. 16. Three barbules from metallic edging of quill of *Anthreptes malaccensis*. Ob. ⅛", Oc. B.

Fig. 17. Tail-quill of *Anthreptes malaccensis*(?), with metallic edging on right side (*m*).

Fig. 18. Three non-metallic barbules from above. Ob. ⅛", Oc. B.

Fig. 19. Three metallic barbules from tail-quill of *Eustephanus fernandensis*. Ob. ⅛", Oc. B.

Fig. 20. Three brilliantly metallic barbules from central tail-quill of *Æthopyga seheriæ*. Ob. ⅛", Oc. B.

Fig. 21. Barbules from same quill, but much nearer rachis; they show partial transformation, and in their natural position exhibit a faint though distinct metallic sheen. This partial transformation occurs chiefly in the case of distal barbules, and produces a visible effect to the unaided eye. Ob. ⅛", Oc. B.

Fig. 22. Yellowish contour-feather from a species of *Cinnyris*, the tips of the barbs diverge and are unconnected.
Fig. 23. Barbules from above feather taken from region marked *a*. Ob. ¼", Oc. B.
Fig. 24. Modified terminal barbules taken from region marked *b*, showing "metallic" structure. Ob. ⅛", Oc. B.
Fig. 25. Three distal barbules from a metallic quill-feather of a Humming-bird, to show notched condition of the lamina in some cases. 25 *a* shows the true shape of the distal region as contrasted with its apparent one under ordinary conditions. Ob. ¼", Oc. B.
Fig. 26. Barbule from edging of tail-quill of Pheasant, non-metallic.
Fig. 27. Dark green metallic barbule from breast-feather of Pheasant.

4. On a Skull of *Orycteropus gaudryi*, Forsyth Major, from Samos. By C. W. Andrews, F.G.S., Assistant in the British Museum (Natural History).

[Received February 4, 1896.]

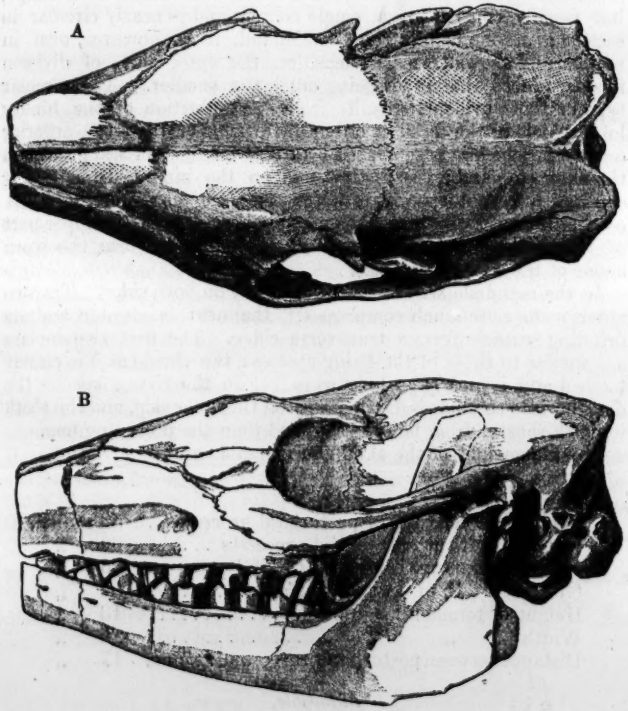
The existence of a member of the genus *Orycteropus* (the Ant-Bear or Aard-Vark) in the Lower Pliocene of Samos was first made known by Dr. C. I. Forsyth Major in the well-known paper [1] in which he described the results of his excavations in that island. In this preliminary note he merely stated that the Pliocene species is about one-fifth smaller than the recent forms and that the lateral metatarsals are proportionately larger. In a subsequent communication [2] he pointed out some characters in the dentition and in the form of the skull, particularly in the size and shape of the lachrymal, which further differentiate the fossil from the living species.

In the present note it is proposed to give figures and a brief description of an exceedingly perfect and well-preserved skull of this species from Samos which has recently been acquired for the National Museum. In this specimen the only important portion missing is the anterior end of the snout, which has been broken off about 5 centim. in front of the orbit and about 3 centim. from the hinder end of the nasals. The right zygomatic arch is lost, but the left is complete, and the tympanic ring, frequently lost in maceration in recent specimens, is preserved on both sides and on the left retains its natural position. The mandibular rami are pressed together so that their lower edges are in contact throughout their length. The size indicates an animal about one-fifth less than the living species, exactly agreeing in this respect with the type of *O. gaudryi*, to which species it is referred. It will be seen that, on the whole, the fossil resembles the northern *Orycteropus æthiopicus* rather more than it does the southern *O. capensis* [3].

On the occipital surface the mastoid portion of the periotic is less prominent than in the recent species, and is more overlapped by

[1] Comptes Rendus de l'Académie des Sciences, vol. cvii. (1888), p. 1178.
[2] Proc. Zool. Soc. 1893, p. 239.
[3] For a detailed comparison of the skulls of the recent species, see Duvernoy, "Mémoire sur les Orycténropes," Ann. Sci. Nat. (Zoologie), ser. 3, vol. xix. (1853), p. 185.

the squamosal, which forms a prominent ridge external to it. The tympanic ring is nearly circular, instead of being oval with its long axis directed downward and forward. The postorbital processes of the frontals are larger, and their hinder edges are sharp and thin. I cannot detect any difference in the profile of the upper surface of the skulls of the recent and fossil forms, except such as may have been caused by a slight crushing of the preorbital region; and the difference in the size and form of the lachrymals pointed out by Forsyth Major cannot be taken as a character of any great importance, for the lachrymal in recent skulls varies very considerably, and in one specimen from Kassala it is extremely similar both in size and shape to the fossil. The antorbital foramen opens above the hinder lobe of $m.^1$, and this is also the case in the Kassala skull; in other specimens it is over m^2.



Skull of *Orycteropus gaudryi*, Forsyth Major.
A, from above; B, from side. About two-thirds natural size.

The mandible differs from that of the recent forms only in the

position of the condyle, which is borne upon a much shorter pedicle and has a more horizontal articular surface.

The minute structure of the teeth is precisely as in *O. capensis*, so that they give no indications of the possible origin of their peculiar character.

In the left maxilla six teeth remain in place, and in front of them is an empty alveolus; on the right there are five teeth and two alveoli. The most anterior tooth preserved is pm. 3 (counting from behind forward); this is small and laterally compressed, its flat crown slopes downward and forward. The next is similar, but less compressed. The hindermost premolar is a stout simple tooth; its worn crown consists of two flat surfaces meeting in an angle and forming a transverse ridge. The two first molars are very similar to those of the recent species, but the last ($m.^3$) is rather different. In the living forms it is somewhat variable in shape, but usually consists of a single column and is nearly circular in section; in one skull from Somaliland, it is, however, oval in section and shows traces, at least on the outer side, of division into two lobes, the hinder being much the smaller. The circular type of tooth evidently results from the reduction of the hinder lobe, which in the fossil is only a little smaller than the anterior one, from which it is separated by a well-marked vertical groove on the outer side and a less distinct one on the inner. In a young skull of a recent species, in which the last molars are only just coming into use, they are distinctly bilobed, so that the upper part of the crown of the unworn tooth resembles in form the worn molar of the Pliocene species.

In the mandible six teeth are preserved on both sides. The two anterior ones are much compressed; the next is stouter and its grinding surfaces form a transverse ridge. The first two molars are similar to those of the living species: the third ($m._3$) is clearly bilobed and is nearly as long as $m._2$. In the recent species the division into columns is distinct only on the inner side, and the tooth is much shorter from before backward than the preceding one.

The dimensions of the skull and mandible are:—

Skull.

Width between ends of postorbital processes	53	millim.
Outside width at postglenoid processes	60	„
Width of cranium behind postorbital processes	36	„
Greatest width of occipital surface	52	„
Height of foramen magnum	13	„
Width „ „	22	„
Distance between postorbital process and zygoma	17	„

Mandible.

Height at coronoid process	65	millim.
„ „ condyle	52	„
Height of ramus behind last molar	16	„
„ „ in front of first molar	12	„

Dimensions of the teeth:—

Length of upper	m. 3	7·5 millim.
„ „	m. 2	12 „
„ „	m. 1	11 „
„ „	pm. 1	8 „
„ „	pm. 2	6 „
„ „	pm. 3	5 „
„ „	pm. 4 (alveolus only)	4 „
Length of lower	m. 3	10 „
„ „	m. 2	11 „
„ „	m. 1	11 „
„ „	pm. 1	8 „
„ „	pm. 2	6 „
„ „	pm. 3	5 „
Length of upper molar series.....		31 „
„ lower „ „		34 „

The very close resemblance between the Lower Pliocene and recent species is both remarkable and disappointing, for it might have been expected that in the former some generalized characters would be found that would throw some light on the probable ancestry of this most aberrant mammal; this, however, it has been seen, is not the case.

As Dr. Forsyth Major has pointed out, the former distribution of the genus seems to show that it is of northern origin and that it spread into Africa along with the rest of the Pliocene Mammalia with which it has been found, and was not derived from any southern land-area. Although at present it has been found only at Samos and at Maragha in Western Persia, some twenty degrees farther east, the accompanying mammalian fauna has a much wider range. It has been met with at Concud in Spain, Mt. Leberon in Southern France, Baltavar in Hungary, and Troy in Asia Minor; it probably also ranged far to the east of Maragha, since *Rhinoceros blanfordi*, a species occurring in that locality, is also recorded from Baluchistan and from Southern China, where it is associated with a Giraffe. Although *Orycteropus* has not yet been discovered in these localities, it will probably be found to have ranged far both to the east and west of its limits as at present known.

5. A Contribution to the Knowledge of the Anatomy of *Rhynchops*. By Frank E. Beddard, M.A., F.R.S., Prosector to the Society.

[Received Febuary 4, 1896.]

So far as I am aware the existing knowledge of *Rhynchops* is entirely derived from a paper by Brandt[1] upon its osteology. I found, therefore, with great pleasure a specimen of this genus among the spirit-preserved birds sent home from Western Africa

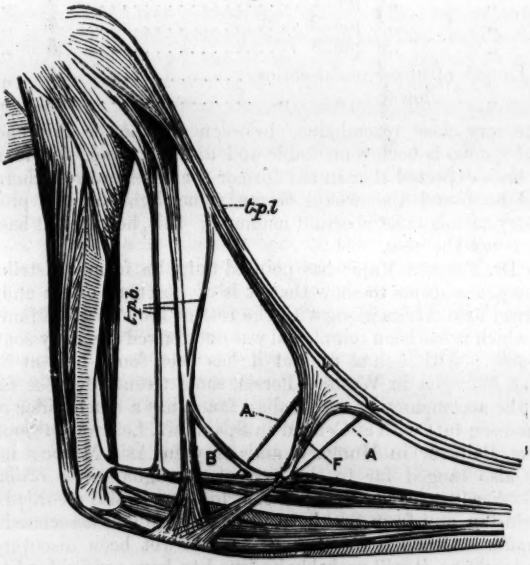
[1] Mém. Acad. Sci. St. Pétersb. sér. 6, Sci. Nat. iii. p. 218 (1840).

by the late W. A. Forbes, upon the dissection of which the following notes are based.

As to external characters, the pterylosis offers no salient point of difference from that of the Gulls as described by Nitzsch. The oil-gland is tufted. There are 12 rectrices. The bird is aquinto-cubital. As regards the alimentary viscera the most important fact to comment upon is the rudimentary and nipple-like character of the cæca.

The *tensores patagii* are illustrated in the drawing exhibited (woodcut, fig. 1). They are exactly like those of *Rissa tridactyla*,

Fig. 1.



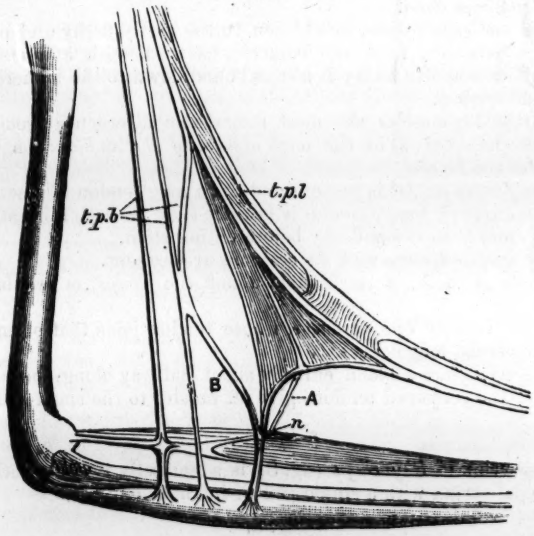
Muscles of the patagium of *Rhynchops*.

t.p.l., tendon of *tensor patagii longus*; *t.p.b.*, *tensor patagii brevis*; B, its wristward slip; F, patagial fan; A, tendinous threads on ulnar side of arm.

of which I possess a drawing by Mr. W. A. Forbes. There are two tendons to the *tensor brevis*, of which the anterior is for the greater part of its length made up of three separate strands. The hinder tendon is much slighter. The anterior tendon gives off a little way from the forearm a wristward slip (fig. 1, B), from which, where it joins the tendon of the extensor radialis metacarpi, a patagial fan (F) arises which joins the *longus*. This fan as well as the main tendon of the *brevis* are continued over to the ulnar side of the forearm as a diffuse glistening tendon. From the point where the wristward slip of the *brevis* springs there is another connection with the *longus*, which is lettered A in the drawing (fig. 1).

Rhynchops shows a peculiar feature of *Larus argentatus* (*cf.* fig. 2) and of most Auks in the existence of these patagial tendons (A) on the ulnar side of the arm. In *Rhynchops* there are two instead of only one of these; they run side by side obliquely, or really at right angles to the *longus* tendon when the wing is extended, and end upon the *extensor metacarpi radialis* muscle, on the inner side of the forearm; the posterior of the two is inserted at a point

Fig. 2.



Patagial tendons of *Larus argentatus* (after a MS. sketch by the late W. A. Forbes).

n, osseous nodule. Other lettering as in fig. 1.

almost exactly corresponding with the insertion of the wristward slip of the *brevis*, though, as already said, on the opposite side of the arm. On the opposite wing I could find only a single tendon; it was, however, very much longer, reaching further over the arm. The *pectoralis* muscle sends a slip to the patagial tendons, which is slightly differentiated from the rest of the *pectoralis* as a muscular belly; there is also a yellowish fibroid slip from the deltoid crest of the humerus.

I could detect *no biceps slip to the patagium* on either wing. I looked, of course, very carefully for this muscle, as it is present in all the immediate allies of *Rhynchops*.

The *biceps* is a very slender muscle which arises from the coracoid only. I found no trace of the missing humeral head. The muscle is divisible into two halves, the division commencing early in the slender tendon of origin. The outer of the two

halves, that which abuts upon the patagium, is chiefly tendon, there being a belly of only about half an inch in length, strung as it were upon a long thin tendon. The inner half of the muscle, on the contrary, is muscular almost to its insertion.

I did not succeed in finding any traces of the *expansor secundariorum*, for which as a characteristic muscle I looked carefully.

The *deltoid* is not extensive. Its humeral attachment occupies rather more than the first third of that bone. It ends exactly on a level with the end of the attachment of the anterior section of the *latissimus dorsi*.

The *anconæus longus*, in addition to the partly fleshy and partly tendinous origin from the coracoid, has a longish and entirely tendinous scapular head; it also is bound down to the humerus by a broad tendon.

In the leg-muscles the most remarkable divergence from the Larine character is in the *total absence of the ambiens* (on both sides of the body).

The *femoro-caudal* is present and has a long tendon of insertion.

The *accessory femoro-caudal* is broader than the latter, is entirely fleshy, and joins it some way before its insertion.

The *semitendinosus* with its *accessory* are present.

There is nothing remarkable about the *biceps* or *semimembranosus*.

There is only one *peroneus*, whose tendon joins that of one of the superficial long flexors.

The *deep flexors* blend entirely about halfway along the metatarsus; the conjoined tendons give off no slip to the small hallux.

§ *Syrinx*.

The syrinx of *Rhynchops* (fig. 3) is a perfectly typical tracheobronchial syrinx with a single pair of intrinsic muscles.

Fig. 3.

Syrinx of *Rhynchops*; lateral view.

The last three or four tracheal rings are closely united, but not fused, to form a box, and there is a well-marked pessulus. The first bronchial semiring, to which the intrinsic muscles are attached, is much longer from back to front, and is arched in the usual way. After this follows a rather deep semiring, which is immediately succeeded by several thinner bars; these latter get deeper towards the opening into the lungs.

§ *General Observations and Classification of the* Laridæ.

In having no ambiens *Rhynchops* is unique among the Laridæ, but not among the Limicolæ in general, if, that is to say, we include, as I think should be done, the Auks in the Limicolæ. In the latter group the ambiens is sometimes present and sometimes absent. The Gull-tribe can be conveniently (even if merely artificially) divided up as follows, *Rhynchops* undoubtedly belonging to a distinct subfamily, not definitely nearer to the Terns than to the Gulls:—

Sterninæ. ABXY+[1]. Cæca nipples. Biceps slip present. Expansor secundariorum absent.

Rhynchopinæ. ABXY—. Cæca nipples. Biceps slip and expansor secundariorum absent.

Larinæ. AXY+. Cæca nipples, biceps slip, and expansor secundariorum present.

Stercorariinæ. AXY+. Cæca long. Biceps slip present. Expansor secundariorum absent.

I should regard *Gygis* as a Gull and *Anous* as a Tern, on account of their leg-muscles; but then *Anous* has the *expansor secundariorum*. These two genera require further investigation before they can be placed; and I am a little suspicious that they may be found to destroy the neatness of the above arrangement.

March 3, 1896.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of February 1896:—

The total number of registered additions to the Society's Menagerie during the month of February was 50, of which 20 were by presentation, 2 by birth, 17 by purchase, 2 in exchange, and 9 were received on deposit. The total number of departures during the same period by death and removals was 79.

The following additions are of special interest:—

1. A young male Klipspringer Antelope (*Oreotragus saltator*), presented by Commander Alfred Paget, R.N., H.M.S. 'Dolphin,' Port Said.

[1] AXY+ in a species of *Sternula* (Forbes, MS.).

Capt. Paget informs me that this animal was captured in the Khor Abent, halfway between Suakin and Cassala. It is new to the Collection.

2. A Hybrid Antelope, bred between the male of *Tragelaphus gratus* (received from the Hamburg Gardens, July 27, 1894) and a female *Tragelaphus spekii*, presented by James A. Nicholls, Esq., F.Z.S., Oct. 14, 1890.

This curious hybrid in general appearance appears to take after the rufous colour of the female of *T. gratus*. It has a black dorsal stripe and is spotted on the flanks. So far as we can tell, the period of gestation in this instance was about seven months.

Mr. G. E. H. Barrett-Hamilton, F.Z.S., exhibited several fresh-looking skeletons of the Norway Lemming (*Myodes lemmus*), obtained by Dr. H. Gadow in caves near Athouguia, in Portugal, and made the following remarks:—

Early in the year 1895 Dr. H. Gadow handed me for examination some skeletal remains of a species of small mammal, which, on a first inspection, appeared to be those of some species of Vole—*Microtus*. Thinking the remains were those of Voles I put them aside for a time, but later on, when I had an opportunity of examining them more carefully, I found, to my surprise, that they consisted of some skeletons and detached bones of the Norway Lemming, *Myodes lemmus*. When first received by me the remains consisted of a good many fragments and single bones, and of two almost complete skeletons. These latter were completely enveloped in the original skin, which had become so dried and hardened that in order to enable myself to examine the skeletons I had to get it removed. The whole appearance of the specimens was so fresh that, unaware as I was of their true character, I had the dried skin, which enveloped them like mummies, removed, so that, I regret to say, not one of these most interesting specimens has been preserved in the condition in which I received it. Some of the vertebræ, however, are still connected together by the dried remains of the ligaments. This, and the whiteness and excellent preservation of the bones, will show how easy it was to be deceived as to their nature, and to come to the belief that they were of recent origin and perhaps unimportant.

This discovery of Dr. Gadow's is of very great interest, as it enormously increases our knowledge of the distribution of the Norway Lemming in past times, and helps to throw light upon the former climatic conditions of Portugal.

According to Professor R. Collett[1], the most recent authority on the Norway Lemming, this animal has its principal home in Norway, where it inhabits all the mountain plateau from north to south of the country, and in some localities is distributed down to the sea-level. Its range includes also Swedish and Russian Lapland, but ceases eastward on the western shores of the White Sea, and, though the animal is spread over the greater part of the

[1] '*Myodes lemmus*, its Habits and Migrations in Norway.' Christiania, 1895.

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Kola Peninsula, it does not seem to habitually appear so far eastward as Archangel. Thus the present southern range of the animal does not extend below about 58½° North latitude. We know, however, that in recent geological times it had a much more southern distribution, extending at least as far as the south of England and Saxony, since its remains have been found in the Somersetshire caves, six lower jaws from which, now in the Taunton Museum, were identified by Sandford[1]. These bones are said to be slightly smaller and to have the condyles more slender than those of recent specimens, but to agree very closely with them, especially with the skulls of young animals[2]. The only other locality where, so far as I am aware, the bones of this species have been found is at Quedlinburg, in Saxony, where Hensel[3] found it, together with *M. torquatus*, in 1855, among fossils from the diluvium. The present discovery will therefore show that the range of the Norway Lemming extended formerly to at least nearly the south of the Iberian Peninsula, and that, too, judging from the fresh appearance of the remains, in quite recent geological times.

The present skulls resemble those of recent Lemmings very closely indeed, but, like the specimens found in the Somersetshire caves, they are smaller than those of large adult recent animals. I cannot, however, find any characters sufficiently important to enable me to separate the two specifically.

In conclusio ı, I should like to draw attention to the following statement, which is to be found on pages 147 and 148 of Messrs. Abel Chapman and W. J. Buck's work on 'Wild Spain' (chapter xii.). Writing of Ibex-shooting in the Sierra de Grédos of Old Castile, these authors remark:—"One day, close to the snow-line, we came across a fat, blue-grey, little beastie, apparently of the Dormouse tribe (*Liron*, in Spanish), but he got to earth, or rather rock, ere we could capture him." This description is too vague to enable me to do more than to make a suggestion, and the suggestion that Lemmings exist in Spain at the present day is too startling to be lightly brought forward; but I should like to point out that the description would apply very well to *Myodes schisticolor*—a species which (if it really be a good species) is, I believe, only distinguishable from *M. lemmus* by its bluish-grey colour.

At all events, in view of Dr. Gadow's remarkable discovery of fresh-looking Lemming bones on comparatively low ground, it would be interesting to know what is the true nature of the "fat, blue-grey, little beastie"; and I venture to express a hope that this animal will be found to be a Lemming or a Vole, and

[1] W. A. Sandford, in Quart. Journ. Geol. Soc. vol. xxvi. (1870), p. 125, pl. viii. fig. 3; and Dove, Somerset. Nat. Hist. Soc. vol. xv. (1870), p. 55.

[2] H. P. Blackmore and E. R. Aston, in P. Z. S. 1874, pp. 460–471.

[3] Zeitschr. deutsch. geol. Gesell. vii. (1855), pp. 458–501; also at Wolfenbüttel, A. Nehring in Zeitschr. für ges. Naturwis. Bd. xlv. p. 1 (1875), and in Kent, E. T. Newton, Geol. Mag. 1890, p. 452, and Quart. Journ. Geol. Soc. vol. l. p. 188 (1894).

not, as supposed by Messrs. Chapman and Buck, one of the Dormouse tribe.

Dr. H. Gadow gave an account of the caves which he had explored in the summer of 1886. They were situated in the province of Estremadura, in the low sierra between the villages of Athouguia and Otta, the nearest town being Santarem. The geological formation was hard white-blue limestone of the Rhætic system. The caves lay only two or three hundred feet above the sea-level, and the particular one which yielded the bones was choked near the entrance with loose dry dust. About a foot below the surface of the dust was found an unpolished flint arrow-head. The cave was absolutely dry, and its horizontal bottom, extending for about 60 feet into the mountain, was covered with about two or three feet of the dust, which contained bones of small Ruminants and of Bear, besides those of the Lemmings. The Lemming-bones were found at the far end of the cave, almost on the top of the dust.

Mr. Sclater opened a discussion on the Rules of Zoological Nomenclature by reading the following paper:—

Remarks on the Divergencies between the "Rules for naming Animals" of the German Zoological Society and the Stricklandian Code of Nomenclature.

Before proceeding to the immediate subject of the discussion which we propose to hold this evening, I wish to call the attention of the meeting to the new work, to be called 'Das Tierreich,' which has been planned by the German Zoological Society. The object of it is to give an account of all the known species of recent animals described up to the present period. The proposed work will embrace, as we are informed, the most important synonyms, references to the best figures, and an account of the geographical range added to a short description of every species. This, it must be allowed, is a gigantic undertaking well worthy of a great scientific nation, and we must all heartily wish it success. The described species of recent animals, as will be seen by the table (which has been kindly compiled for me by Dr. David Sharp, F.R.S., with the assistance of his corps of Recorders), numbers some 386,000 species[1]. Supposing that we admit that on the average five

[1] Census Specierum Animalium Viventium hucusque descriptarum: a rough estimate of the number of described species of animals in the sections adopted in the 'Zoological Record':—

	Number.
1. *Mammalia*	2,500
2. *Aves*	12,500
3. *Reptilia* and *Batrachia*	4,400
4. *Pisces*	12,000
5. *Tunicata*	900
6. *Mollusca*	50,000
7. *Brachiopoda*	150
8. *Bryozoa*	1,800
Carried forward	84,250

species can be got into a page (which appears to be barely possible) and allow 800 pages to each volume, 96 volumes would be required to complete 'Das Tierreich.' As, however, the great firm of Friedländer and Son[1] have undertaken the publication of the work, and appear to have agreed to find the necessary funds to pay for the contributions to it, we may, I think, feel tolerably certain that the task will be undertaken, although it is probable that many of us may not live to see its completion.

The German Rules for Nomenclature (App. II. no. 10), to which I am about to direct your special attention to-night, are to be those employed by the various contributors to the 'Tierreich,' as their guide in determining the scientific names to be used in the work. It will be obvious, therefore, that for this cause they are of special importance and are well worthy of our consideration. Prof. F. E. Schulze, who has undertaken the editorship of 'Das Tierreich,' and with whom I have been in correspondence on the subject, having courteously expressed a wish that it might be possible to reconcile the differences between the German Rules and the Code of Nomenclature adopted by the British Association and usually employed in this country, I have undertaken to bring the subject before this Society.

In order to consider whether we can agree it is necessary first to ascertain the points of difference, and these are what I propose to bring forward to-night. But before doing so I will commence with a few general remarks on some of the principal codes of nomenclature that have been put forward by modern zoologists.

As we all know, I believe, the first code that adopted the "law of priority" as its principal rule and originated various other usages, to which we are now well accustomed, was that drawn up by Strickland in 1842 (Appendix II. no. 1). The Stricklandian Code, however, although generally approved and adopted, was not at that time formally sanctioned by the British Association.

In 1863 the late Sir William Jardine took up the subject, and,

[1] The contract between the Deutsche Zoologische Gesellschaft and Messrs. R. Friedländer and Son will be found printed at full length in the 'Verhandlungen' of that Society for 1895, pp. 4 *et seqq.*

	Number.
Brought forward.....	84,250
9. *Crustacea*	20,000
10. *Arachnida*	10,000
11. *Myriopoda* and *Prototracheata*	3,000
12. *Insecta*	250,000
13. *Echinoderma*	3,000
14. *Vermes*	6,150
15. *Cœlenterata*.....	2,000
16. *Spongiæ*	1,500
17. *Protozoa*	6,100
Total	386,000

This may be compared with Dr. Günther's estimates of the described species in 1830 (73,588) and 1881 (311,653), lately published in the 'Annals & Mag. of Nat. History' (ser. 6, vol. xvii. p. 180).

in conformity with a resolution adopted by Section D of the British Association at Newcastle, reprinted the Rules (2). The Committee, of which he was Chairman, was directed to consider what changes, if any, it was desirable to make in them. Certain alterations (six in number in all) were proposed to be made by the Committee, as specified in their Report. This report (3) was finally adopted by the Association in Section D at the Bath Meeting on the 19th September, 1865. It is well to remark, however, that the six proposed alterations of the original Code, although specified at full length in the Report of the Committee, were never incorporated into the text of the Stricklandian Code.

In 1878, at the request of the General Committee[1] of the British Association, I prepared for publication a new edition of the Stricklandian Code, to which I added the Report of the Committee appointed at the Bath Meeting. This edition (4) was published for the Association by Murray of Albermarle Street, and copies of it may still be had on application at the offices of the British Association. There are some here on the table.

In 1877 the American Association for the Advancement of Science took up the question of Nomenclature and appointed Mr. W. H. Dall to investigate the subject. Mr. Dall made an excellent report, which will be found printed in the volume of the Association's Proceedings for 1878 (5).

In 1881 the Société Zoologique de France proposed a Code of Rules prepared by a Committee. These were published at Paris along with a report on the subject prepared by M. Chaper (6).

In the following year (1882) the Congrès géologique International published a set of Rules on Nomenclature (7). Both these codes were intended to apply to Zoology and Botany alike. The rules in both cases are few in number, but are accompanied by valuable commentaries. They do not materially affect the special points now in question, except in rejecting generic names previously employed either in Zoology or Botany.

The highly elaborate and precise Code of Nomenclature which was adopted by the American Ornithologists' Union in 1886, and was published along with the first edition of the 'Check-list of North American Birds' (8), although generally based upon the Stricklandian Rules, deviates from them in several material particulars. The most important of these is, the proposal to commence Zoological Nomenclature with the tenth edition of the 'Systema Naturæ' (1758) instead of the twelfth (1766). The operation of this rule, which will be again alluded to presently, has, as is well known, caused very serious differences in the names applied to the same birds by the English and American ornithologists. The American Code of Nomenclature is also in conflict with us upon the two other points which are proposed for special discussion this evening.

In 1891 the 'Allgemeine Deutsche Ornithologische Gesellschaft zu Berlin' put forward their Code of Zoological Nomenclature, which was adopted at their General Meeting at Frankfort a. Main

[1] See 'Report of the British Association,' 1865, p. 25.

in May of that year (9). These Rules follow the American Rules very nearly, especially as regards the three points which are proposed for special discussion this evening.

In 1892 the International Congress of Zoology at their Moscow Meeting adopted a set of Rules of Nomenclature, which appear to differ little in effect from those of the Société Zoologique de France. These Rules (11) were separately published at Paris in 1895.

We now come to the Rules adopted by the Deutsche Zoologische Gesellschaft in 1894 (10), which are of special importance for reasons that I have already pointed out, and to some of which, as being in direct conflict with those of the Stricklandian Code, I wish to call your special attention this evening. In order to render them more easy of access upon the present occasion I have translated and printed the text of the Rules themselves (see Appendix I., p. 316), though I have not thought it necessary to add to each rule the commentaries and explanations which are appended to them, in smaller type, in the original. On reading them through it will be seen that these rules in many particulars conform to the excellent system originally put forward by Strickland and now generally adopted by zoologists all over the world. The usual sequence of divisions of animals into Orders, Families, Subfamilies, Genera, and Species is recognized. The families are to be formed ending in *-idæ*, and the subfamilies in *-inæ*, and though priority is strictly enforced, corrections in orthography are not only permitted but approved of. In fact there seem to be only three principal points in which the Code of the German Zoological Society differs from ours, and it is to these three points to which I now propose to call your attention, after which I will say a few words on two or three points of minor importance.

1. The German Rules (Sect. 1) disclaim any relation to Botany so that, according to them, the same generic names may be used in Zoology and Botany. This is contrary to the Stricklandian Code (Sect. 10).

It is quite certain that the Stricklandian Code did not allow the same name to be employed for a genus in Zoology and in Botany. But in the British Association revision of 1863, amongst the six alterations proposed to be made in that Code was one "that Botany should not be introduced into the Stricklandian Rules and Recommendations." This, however, I do not take to mean that the Rule alluded to is to be repealed, but merely that the Rules as a whole were intended for Zoologists and not for Botanists. But in the American Code (see Principle IV.) the contrary view was taken and it was enacted that the "use of a name in Botany does not prevent its subsequent use in Zoology." We will take a salient example on this point. The Swifts until recently have been universally called by ornithologists *Cypselus*, and the family to which they belong *Cypselidæ*. *Micropus* of Meyer and Wolf, which has one year's precedence over *Cypselus*, has been passed over, because *Micropus* is an old Linnean term for a genus of plants. In accordance with their Rules the American

ornithologists have recently rejected the name *Cypselus* in favour of *Micropus* and renamed the family *Micropodidæ* accordingly.

While I quite agree that it is not necessary that zoologists and botanists should use exactly the same Code of Nomenclature, for in many respects their practices have long been different, I think it would be a great evil to allow Animals and Plants to be called by the same names, as in some cases it would not be *primâ facie* apparent whether a particular term was intended to refer to an animal or a plant. Besides this, we know that in some of the lower forms it is by no means easy to decide whether certain species should be referred to the animal or to the vegetable kingdom. Strickland was very decided upon this subject, and I see no reason at all why we should deviate from his practice, which up to a recent period has been generally followed by zoologists.

2. Under Sect. 5 of the German Rules the same term is to be used for the generic and specific name of a species, if these names have priority. This is contrary to the Stricklandian Code (Sect. 13).

In the original Stricklandian Code (Section 13) it is enacted that "a new specific name must be given to a species when its old name has been adopted for a genus which includes that species." In the British Association revision of the Code (Recommendation IV.) it was proposed to reverse this Rule, and to throw aside the generic in order to retain the specific name. It was the American Ornithologists' Code, I believe (Canon XXX.), which first formally proposed that specific names, when adopted as generic, should not be changed, and this Rule has now been adopted in both the German Codes.

It should be remarked that the proposal of the B. A. revision to alter the generic name in these cases, instead of the specific, has hardly met with acceptance in any quarter. In Mr. Dall's report upon this subject (5) he well observes:—

"This innovation, the sweeping character of which the Committee cannot have realized, if carried into effect, would uproot hundreds of the generic names best known to science, and so familiar that the fact that they were originally specific names has been almost totally forgotten. Its spirit is opposed to the fundamental principles of nomenclature, and the end to be gained is of the most trivial character."

Although I was a Member of the Bath Committee that agreed to this Recommendation, I must confess that I am strongly opposed to it, and have always followed the opposite course enacted by the original Stricklandian Code, that in these cases the specific name is the one to be changed. Moreover, this last practice has, until recently, been generally adopted by English zoologists. Of late years, however, the "*Scomber-scomber*" principle, as it is familiarly called[1], has met with many supporters. Though inelegant and almost ridiculous, it has, at least, one merit. It

[1] "*Scomber scomber*" (Linn. S. N. ed. xii. p. 492) seems to be the only instance in which Linnæus used the same generic and specific name for a species. But it is doubtful whether this was not really a printer's error, for in the tenth edition (p. 297) he wrote *Scomber scombrus*, and on referring to the two copies of the twelfth edition, formerly belonging to Linnæus himself, and

enables us to retain the original (often Linnean) name, for which there is in many cases great difficulty in finding a substitute that all will agree upon. Moreover, the usage of the same generic and specific term in such cases has now met with extensive acceptance on the Continent. At the same time it is only right to call attention to the formidable changes which the acceptance of the tautonymic principle would cause in the names of some of our most familiar animals. In order to show this clearly I give a list of 25 species of well-known English birds for which we should require a change of names if tautonyms are accepted[1].

3. The German Rules (Sect. 7) adopt the 10th edition of the 'Systema Naturæ' (1758) as the starting-point of Zoological Nomenclature, whereas the Stricklandian Code (Sect. 2) adopts the 12th (1766).

The question of the proper edition of Linnæus's 'Systema Naturæ' to be adopted as the starting-point of the binary system of Nomenclature appears to be the most difficult of the three principal questions now before us to settle satisfactorily, and to involve the most serious consequences. It seems to me reasonable, on a *primâ facie* view, that Linnæus, having been the inventor and founder of the binary system of Nomenclature, should be allowed the credit and the privilege of completing his own work in the manner he thought best. By adopting the twelfth edition of the 'Systema

[1] List of Names of British Birds affected by the tautonymic principle.

B. O. U. List.	Page	Tautonymic names.
Sylvia cinerea	11.	*Sylvia sylvia.*
Regulus cristatus	14.	*Regulus regulus.*
Hypolais icterina	17.	*Hypolais hypolais.*
Cinclus melanogaster	24.	*Cinclus cinclus.*
Troglodytes parvulus	29.	*Troglodytes troglodytes.*
Carduelis elegans	47.	*Carduelis carduelis.*
Serinus hortulanus	49.	*Serinus serinus.*
Coccothraustes vulgaris	50.	*Coccothraustes coccothraustes.*
Pyrrhocorax graculus	66.	*Pyrrhocorax pyrrhocorax.*
Pica rustica	68.	*Pica pica.*
Scops giu	89.	*Scops scops.*
Bubo ignavus	90.	*Bubo bubo.*
Buteo vulgaris	94.	*Buteo buteo.*
Tinnunculus alaudarius	104.	*Tinnunculus tinnunculus.*
Fuligula cristata	129.	*Fuligula fuligula.*
Turtur communis	139.	*Turtur turtur.*
Perdix cinerea	142.	*Perdix perdix.*
Coturnix communis	143.	*Coturnix coturnix.*
Lagopus mutus	144.	*Lagopus lagopus.*
Tetrao tetrix	145.	*Tetrao tetrao.*
Porzana maruetta	147.	*Porzana porzana.*
Crex pratensis	14[illegible]	*Crex crex.*
Grus communis	15	*Grus grus.*
Œdicnemus scolopax	15[illegible]	*Œdicnemus œdicnemus.*
Vanellus vulgaris	161.	*Vanellus vanellus.*

now in the Library of the Linnean Society, it will be found that the second *scomber* is altered, apparently in Linnæus's own handwriting, into *scombrus* (see note on this subject, 'Ibis,' 1895, p. 168). Instead of the *Scomber-scomber* principle it would be better to call it the "tautonymic principle," and names formed upon this principle *tautonyms*.

Naturæ' as our starting-point (as is enacted in the Stricklandian Code) we allow Linnæus this privilege. If we take the tenth edition, as proposed by the American ornithologists, and now adopted in the two German Codes, we deny him the right of correcting his own work, which, under the circumstances, appears to be obviously unfair and injudicious. For it is unquestionably the case that Linnæus altered some of his names in his last and most perfect edition of 1766–68, and added others to his list. If we acknowledge the authority of the authors who wrote between 1758 and 1766 we shall have to change some of Linnæus's best-known names. For example, the Horned Screamer of South America has been universally known to ornithologists as *Palamedea cornuta*, as named by Linnæus in the twelfth edition of the 'Systema,' the genus having been omitted in the tenth edition. In the meanwhile, however, Brisson in 1762 (Orn. v. p. 518) had used "*Anhima*" of Marcgrave as its generic name, and Mr. Stejneger has accordingly proposed to call the Horned Screamer *Anhima cornuta* (Stand. Nat. Hist. iv. p. 135). If this alteration be adopted, the names of the family *Palamedeidæ* and of the suborder *Palamedeæ* will likewise have to be changed.

I will take another example of the inconvenience of allowing Linnæus's names to be superseded. The Common Darter of Central and South America is the *Plotus anhinga* of Linnæus's twelfth edition and is almost universally known under this name, which also gives its name to the family *Plotidæ*. Unfortunately, Brisson in the interval between the two editions of the 'Systema' proposed the generic term *Anhinga* for the same bird, and the American Check-list consequently proceeds to call the Darter "*Anhinga anhinga*," and the family "*Anhingidæ*." It must be admitted that both these alterations, which are consequent upon the adoption of 1758 as the commencement of binary nomenclature in place of 1766, as well as many other changes of the same character which I need not now cite, are matters of considerable importance. Strickland, the founder of our modern Codes of Nomenclature, after deliberately considering the point, adopted the latest and most perfect edition of the 'Systema Naturæ' as his starting-point. I think we should do unwisely to deviate from Strickland's views on this subject. It is true that Strickland proposed to allow such of Brisson's names as were *additional* to those of the twelfth edition of the 'Systema Naturæ' to be retained, but he certainly did not contemplate the supercession of any of Linnæus's names by those of Brisson or of any other authority. On the ground of priority, therefore, I claim that, as first decided by Strickland, we ought to adopt the twelfth and most perfect edition of the 'Systema Naturæ' as the basis of modern Nomenclature. Even if we adopt the tenth edition as our starting-point, a special proviso should be made that none of the names contained in the twelfth edition should be allowed to be disturbed.

There are two or three less important points in Zoological Nomenclature upon which I wish to add a few words.

(1) The German Code, which we are now principally considering

(Canon X.), enacts that the name of the author, if given, should follow the scientific name without any intervening sign. The prevailing practice in this country has been to place a comma after the specific name and before the authority. But on this subject, I must say, I think that the German Code has good reason on its side. When, for example, we write *Turdus viscivorus*, Linn., we mean in fact *Turdus viscivorus Linnæi*—that is, the *Turdus viscivorus* of Linnæus, *Linnæi* being in the genitive case after the nominative *Turdus viscivorus*. If this view, which, no doubt, is the correct one, is taken, it is obvious that no comma is required between the nominative and the genitive which follows it. The adoption of this reform would save a great many thousand commas in our zoological works. When the author's name refers only to the specific and not to the generic term, both English and German Codes agree that the author's name should be enclosed in parentheses.

I must remind you, however, that the invariable addition of an author's name to a scientific name is a modern practice, and in many cases wholly unnecessary. It converts a binary system into a trinary one. In familiar names, such as *Turdus viscivorus*, for example, it is obviously quite unnecessary to add any authority to such a well-known term.

(2) Another point on which I am glad to be able to agree with the German Code is that (see Canon V.) it permits orthographical corrections "when the word is, without doubt, wrongly written or incorrectly transcribed." The American rule upon this subject (Canon XXXI.), and still more the American practice, is, in my opinion, simply perverse. The rule enacts that "neither generic nor specific names are to be rejected for faulty construction, inapplicability of meaning, or erroneous signification." They therefore contemplate, and not only contemplate but insist upon, the surrender of the plainest rules of grammar to the principle of priority. We have only to turn over the pages of the 'Check-list' to find abundant illustrations of this deformity. *Œstrelata* is written *Æstrelata*, although it is probable that Bonaparte, who was a good classical scholar, only spelt it this way by a slip of his pen: *Aithyia* is spelt *Aythya*, although we know, from its obvious Greek equivalent, that this is wrong: *Heniconetta* is used without the *H*, although the Greek word from which it is derived, carried an initial aspirate: *Pediœcetes* is written *Pediocœtes*, as originally misspelt by Baird, although there can be no doubt that he meant by it an inhabitant (οἰκητής) of the plain (πεδίον). We will not multiply examples of these errors, but need only remark that no one with a pretence to a classical education is likely to submit to the causeless infliction of such barbarisms.

The German Code is quite on our side in this instance and not only permits such corrections but gives excellent examples (see explanation to Sect. V.) of the proper way in which they should be carried out.

Whether corrections of obvious misstatements of fact, and the consequent rejection of certain names, should be allowed is another question. To me it seems absurd to call an American bird *Bucco*

capensis, and a Tortoise not found in Chili *Testudo chilensis*. I have consequently refused to use such names, preferring accuracy to priority. But the American Code, it is quite clear, does not permit such alterations, and I fear that the German Code under the explanations of Sect. V. is against my views upon this point. On this subject, however, the original Stricklandian Code (see explanations to Sect. X.) clearly rules in my favour.

(3) There is one point which seems not to have been touched upon in any of the Rules hitherto promulgated. It is the last to which I shall call your attention this evening. That is, the expediency of rejecting ambiguous specific names in certain instances. An example of such a case will best explain my meaning. I will take a well-known one, but there are many like it. *Lepus timidus* of Linnæus was probably intended by the learned Swede as the epithet of the Mountain or Variable Hare of Northern Europe. It has, however, until recently, been almost universally applied to the common lowland species, *Lepus europæus* of Pallas[1]. Recent authors having discovered the error have proposed to re-impose the name of *Lepus timidus* upon the Northern species=*Lepus variabilis*, Pallas. I maintain, however, that, under the circumstances that have happened, *Lepus timidus* can no longer be used as a name at all. It is perfectly useless as a specific designation, because when *Lepus timidus* is spoken of (whether 'Linn.' be added to it or not) nobody can tell without further information whether it is intended to indicate *Lepus variabilis* or *Lepus europæus*. Under such circumstances the specific term *timidus* ought to be considered as "void for ambiguity" and the next given name "*variabilis*" of Pallas employed in its place. There are many other cases of the same sort, but of course such rejections should be sanctioned only in extreme cases, when it is certain that the retention of the older name will lead to confusion.

The Canon that I should suggest on this subject would be something as follows:—

Specific names which have been applied habitually to one species but can be proved to be properly applicable to another may be superseded by the next oldest applicable term in both cases.

Before concluding this address I will say a few words as to my views on the vexed subjects of trinomials. That subspecies actually exist in nature cannot, I think, be denied by anybody who believes in the origin of species by descent. Nearly all forms of animal life, which have a wide distribution, show differences when individuals from the two extremes of the range of the species are compared. These differences are in many cases united by intermediate forms which occur in the more central portion of the range. "Subspecies" appears to me to be an excellent term to designate the slight differences exhibited in these cases, far better than "climatic" or "geographical" variety, which is often used for them. We are thus enabled to retain "variety" for abnormal variations from the typical form (such as albinisms &c.) which occur without

[1] "See Bell's 'British Quadrupeds,' p. 331 (1884); Blasius, Wirbelth. Europ. p. 412 (1857).

reference to locality. The students of geographical variation in America, particularly those of Mammals and Birds, may have gone a little into the extreme in recognizing subspecies, but there can be no question that the phenomenon occurs, and is well worthy of record under a name of some sort. The British forms of the Coal-Tit and the Marsh-Tit, which have been named *Parus britannicus* and *Parus dresseri*, appear to me to be good instances of subspecies. I should propose to call them *Parus ater britannicus* and *Parus palustris dresseri*, while the corresponding forms of the continent should be termed *Parus ater typicus* and *Parus palustris typicus* when they are spoken of in the restricted sense only. In ordinary cases, however, it is sufficient to say *Parus ater* and *Parus palustris* without any reference to the subspecies. To give these slight and in some cases barely recognizable variations the same rank as is awarded to *Turdus musicus* and *Turdus viscivorus* seems to me to be highly undesirable, and the recognition of subspecies indicated by trinomials gives us an easy way out of the difficulty.

Finally I may be permitted to say that in questions of priority, as in everything else, it is the extreme men that lead us into difficulties, and that have made the very mention of "priority" distasteful to some of our best workers in Zoology. Some ardent spirits seem to take a pleasure in inventing excuses for alterations in the best and most long-established names without considering, and without even caring, whether subsequent writers will consent to follow them. More moderate systematists are wise enough to let names remain as they are, unless there is an absolute necessity for making a change. In the case of many of the names of the older authors, which we are invited to associate sometimes with one species and sometimes with another, it is often simply a matter of opinion or, I may say, conjecture as to which out of half-a-dozen species they were intended to refer. *Accipiter korshun* of S. G. Gmelin is a noted instance of this sort. It was first resurrectionized in 1874 by Dr. Sharpe as the proper name of the Black Kite. Other authors have referred it to the Golden Eagle, and even, I believe, to one of the Owls. Surely it is better to consign such an indefinite term as this to the limbo of unrecognizable synonyms. In reviving the name *Anser fabalis* for the Bean-Goose—a term which has slept in peace ever since it was invented by Latham in 1785—we must allow that one of our leading ornithologists had better grounds to go upon. There can be no question that Latham translated the name of "Bean-Goose" into Latin as "*Anser fabalis*." At the same time there can be little doubt that he did not consider that in doing this he was inventing a new specific term for that well-known bird, which, like everybody else for the last 110 years, he continued to call *Anser segetum*. It is surely sufficient to quote such uncertain names amongst our synonyms without adopting them as definite designations of familiar species. It is, I repeat, the extremist and the sensationalist, who strive to astonish us by carrying out the law of priority to its "bitter end," that have caused the disgust which many of us feel at the mere mention of priority in nomenclature.

Appendix I.

Rules for the Scientific Naming of Animals, compiled by the German Zoological Society.

A. General rules.

1. Zoological Nomenclature includes extinct as well as recent animals, but has no relation to botanical names.

2. Only such scientific names can be accepted as are published in print, in connection with a clear description either by words or figures.

3. Scientific names must be in Latin.

4. Names of the same origin and only differing from each other in the way they are written are to be considered identical.

5. Alterations in names otherwise valid are only permitted in accordance with the requirements of Sections 13 and 22, and further for the purpose of purely orthographical correction when the word is without doubt wrongly written or incorrectly transcribed. Such alterations do not affect the authorship of the name.

6. Of the various permissible names for the same conception only the one first published is valid (Law of Priority).

7. The application of the Law of Priority begins with the tenth edition of Linnæus's 'Systema Naturæ' (1758).

8. When by subsequent authors a systematic conception is extended or reduced, the original name is nevertheless to be regarded as permissible.

9. The author of a scientific name is he who has first proposed it in a permissible form. If the author's name is not known, the title of the publication must take its place.

10. If the name of the author is given it should follow the scientific name without intervening sign. In all cases in which a second author's name is used a comma should be placed before it.

11. Class (*classis*), Order (*ordo*), Family (*familia*), Genus (*genus*), and Species (*species*) are conceptions descending in rank one after the other, and are to be taken in the order here given. These terms should not be employed in a contrary or capricious relation or order.

B. Rules for designating species.

12. Every species should be designated by one generic and one specific name (Binary Nomenclature).

13. The specific name, which should be treated always as one word, should depend grammatically upon the generic name.

14. The same specific name can only be used once in the same genus.

15. In the case of a species being subdivided, the original name is to be retained for the species which contains the form originally described. In doubtful cases the decision of the author who makes the separation shall be followed.

16. When various names are proposed for the same species nearly

at the same date, so that the priority cannot be ascertained, the decision of the first author that points out the synonymy should be followed.

17. In the case of species with a cycle of generation of different forms, the specific term must be taken from an adult form capable of reproduction. In these cases, as also in species in which Polymorphy occurs, the Law of Priority must be observed.

18. The author of the specific name is the author of the species.

19. The author's name should be placed in parentheses when the original generic name is replaced by another.

20. Hybrids should be designated either by a horizontal cross between the parents' names, or by these names being placed one above the other with a line between. The parents' sexes should be stated, when known. The name of the describer of the hybrid should be added, preceded by a comma.

C. RULES FOR THE NAMES OF SUBSPECIES AND OTHER DIVERGENCES FROM TYPICAL SPECIES OR SUBSPECIES.

21. When constant local forms, varieties, strains, &c. require special names, these names should be placed after the specific name. The rules for such names are the same as those for specific names.

D. RULES FOR GENERIC NAMES.

22. Names of genera should be substantives, and of the singular number. They should be one word and be written with a large initial letter. If a subgenus is used, its name (which follows the same rules as a generic name) should be given in parentheses after the generic name.

23. A generic name is only valid when a known or a sufficiently characterized species (or several species) is referred to it, or when a sufficient diagnosis of it is given.

24. The same generic name can only be employed once in Zoology Nor can names already proposed as subgeneric be employed also as generic names in another sense.

25. When several generic names are proposed for a genus at nearly the same date, so that their priority cannot be settled, the name for which a type-species is given is to be preferred. In all uncertain cases the decision of the author who first arranges the synonymy is to be followed.

26. When a genus is separated into several genera the old name must be retained for the type-species. If this cannot be positively ascertained, the author who splits up the genus must select one of the species originally in the genus as the type. When a subgenus is raised to generic rank the subgeneric name becomes the generic name.

E. RULES FOR THE NAMES OF THE HIGHER SYSTEMATIC GROUPS.

27. Names for higher systematic groups of animals must have a plural termination.

28. Names of Families and Subfamilies must henceforth be taken from the name of one of the genera belonging to the group, and formed from the stem of that name, with the addition of *-idæ* (plural of *-ides* [Gr. *-ειδης*], masc.) for the Families and *-inæ* (fem.) for the Subfamilies.

Appendix II.

Titles of the principal Modern Codes of Zoological Nomenclature.

1. Report of a Committee appointed to consider the Rules by which the Nomenclature of Zoology may be established on a uniform and permanent basis. *London*, 1842. [Rep. Brit. Assoc. Adv. Sci. 1842, pt. 1, p. 105 (1843), also printed separately.]
2. Rules for Zoological Nomenclature by the late Hugh E. Strickland, M.A., F.R.S., authorized by Section D of British Association at Manchester, 1842. Reprinted by Requisition of Section D at Newcastle, 1863. *Edinburgh*, 1863.
3. Report of a Committee "appointed to report on the changes which they may consider desirable to make, if any, in the Rules of Zoological Nomenclature drawn up by Mr. H. E. Strickland, at the instance of the British Association at their Meeting in Manchester in 1842." *London*, 1866. [Rep. Brit. Assoc. Adv. Sci. 1865, pt. 1, p. 25 (1866).]
4. Rules for Zoological Nomenclature drawn up by the late H. E. Strickland, M.A., F.R.S. (assisted by many Zoologists, British and Foreign), at the instance of the British Association. [New edition with preface by P. L. Sclater.] *London*, 1878.
5. Report of the Committee on Zoological Nomenclature to Section B, of the American Association for the Advancement of Science, at the Nashville Meeting, August 31, 1877. [Proc. Amer. Assoc. Adv. Sci. 1877, p. 7 (1878).]
6. Société Zoologique de France. De la Nomenclature des Êtres organisés. Règles applicables à la Nomenclature des Êtres organisés proposées par la Société Zoologique de France. *Paris*, 1881.
7. Règles à suivre pour établir la Nomenclature des espèces. Rapport du Secrétaire de la Commission H. Douvillé. Congrès géologique International. Compte Rendu de la 2me Session, Bologne, 1881. *Bologne*, 1882.
8. The Code of Nomenclature and Check-list of North American Birds, adopted by the American Ornithologists' Union. *New York*, 1886.
9. Regeln für die zoologische Nomenclatur. Angenommen von der Allgemeinen Deutschen Ornithologischen Gesellschaft zu Berlin auf der XVI. Jahresversammlung in Frankfurt a. M. am 12. und 13. Mai, 1891. [J. f. O. 1891, p. 315; also published separately.]
10. Regeln für die wissenschaftliche Benennung der Thiere

zusammengestellt von der Deutschen Zoologischen Gesellschaft. *Leipzig*, 1894.

11. Règles de la Nomenclature des Êtres organisés adoptées par les Congrès Internationaux de Zoologie (Paris, 1889; Moscou, 1892). *Paris*, 1895.

A communication was read from Graf Hans von Berlepsch, C.M.Z.S., expressing his regret at not being able to be present on this occasion, and giving his opinion on the three points specially discussed. He was not disinclined to give way on the first, but maintained the necessity of the second and third alterations proposed in the German Rules.

The President (Sir William Flower) said that the question of nomenclature was a most important one in the study of Natural History. The existing confusion was caused, not only by the absence of definite and universally accepted rules, but also by divergences in the mode of interpretation of such rules as were accepted—divergences which he feared would always exist, however theoretically perfect the rules may be made. He allowed that the tautonymic principle, unfortunate as it was in many respects, was the logical outcome of the system of priority, the basis of the Stricklandian and all other Codes. The evil arose from the use of specific names in a generic sense, a practice which never ought to have been permitted. With the various Codes now before us it was sometimes difficult to discriminate between regulations for the introduction of new names, and those applying to the treatment of names already in use—two objects which must be kept apart. In the former case we could not be too strict, but in the latter Sir William Flower contended that there should be some latitude allowed in favour of universal usage, and he objected to the suppression of a name known to the whole scientific world by one which had been buried and forgotten almost as soon as it was called into existence. For instance, he did not like the revival of *Anser fabalis* for the well-known *A. segetum*, nor of the genus *Procavia* for *Hyrax*. With regard to the 10th or 12th edition of the 'Systema Naturæ' for a starting-point, he had always preferred the British Association ruling in favour of the latter, but it was evident that the former was gaining ground, and would probably be eventually adopted. In conclusion, although he said he was glad that Mr. Sclater had introduced the subject, as a discussion like this must help to clear up our ideas upon it, he was not very hopeful of an absolute agreement ever being arrived at.

Mr. Hartert said that the Code of the German Zoological Society was almost the same as that of the German Ornithological Society. With regard to names used in Botany and Zoology, he considered that from a practical standpoint it would be almost impossible to create a name if the same rules applied to both, because it would necessitate a search through botanical as well as zoological literature before a name could be settled upon. He therefore thought Botany should be ignored, for mistakes as to whether a name was

meant for a plant or an animal could seldom, if ever, occur. He thought the tautonymic principle ought to be accepted. The correct starting-point of Zoological Nomenclature, he was of opinion, was the 10th ed. of the 'Systema Naturæ,' because in that edition Linnæus first made use of the binary system of nomenclature; and as the question of justness had been mentioned he considered that it would be unjust to authors who created names between the dates of the two editions, if the twelfth were adopted; he was, moreover, of opinion that if the 12th edition were adopted, because it contained corrections and emendations of the older edition, it would make a bad precedent, and that any other author might, if so inclined, claim to alter his original names after he had created and published them, and so cause confusion. He agreed with Mr. Sclater that the comma between the specific name and the authority was unnecessary. With regard to the law of priority, he thought that if that law was accepted at all it ought to be carried out thoroughly. He followed Mr. Sclater in his opinion on trinomials.

Prof. Lankester, F.R.S., said that the *main* consideration in regard to the rules of nomenclature should be that of convenience, and the digging up of old names ought to be avoided. He thought the 12th edition of the 'Systema Naturæ' should be adopted as the starting-point of Zoological Nomenclature, as a tribute of respect to Linnæus, since it was the last edition of that work and contained Linnæus's revised list of genera and species. On the whole, he was inclined to accept the tautonymic principle, but he thought that some difficulty arose owing to the existence of doubts in some cases as to which was the original species intended to bear the name. He suggested that an International Committee under the auspices of this Society should be formed, *not* to draw up a code of rules, but to produce an *authoritative* list of names—once and for all—about which no lawyer-like haggling should hereafter be permitted. Rules such as those embodied in the Stricklandian Code might be laid down for guiding the *future* action of makers of specific and generic names. But with regard to the past what was needed was, not a *principle* as to the application of which everyone might argue and differ and cause confusion, but an authoritative declaration admitting of no appeal and of no discussion. Let the zoologists of Britain, America, France, and Germany agree that such a list of the names of all known animals shall be produced once for all, and let this list take absolute and indisputable precedence.

Mr. Elwes said that the Rules of the Stricklandian Code, though excellent at the time they were instituted, were not now equally applicable to all branches of Zoology. The attempt to make the 10th or even the 12th edition of Linnæus the starting-point for specific names would, if applied strictly, soon bring the nomenclature of Lepidoptera into a hopeless state of confusion, which would result in deterring beginners from following any rules but those of convenience. After all,

specific names were given to natural objects only in order that naturalists might know what they were talking and writing about. He thought that uniformity was much more important than propriety, and the only way of solving a difficulty that was yearly increasing would be to appoint International Committees in various branches of science, which should be empowered to fix as a starting-point for specific nomenclature some very much more recent period than that of Linnæus. Whenever a catalogue or standard work in any branch of Zoology could be found, such as Staudinger's 'Catalogue of Palæarctic Lepidoptera,' 1871, the nomenclature of which was based on a careful study, and a sufficient knowledge of the natural objects of which it treated, so that its nomenclature had been almost universally accepted and adopted, he would accept its specific names right or wrong, and look on any attempt to go back to earlier authors, many of whom knew little or nothing of the species they attempted to describe, as a great injury to science.

It was very often impossible to know with certainty what these authors meant, and even when the types existed they were frequently, as in the case of many of Walker's so-called types of Lepidoptera, worse than useless. Such changes would not, of course, apply to generic names, which must be altered as our knowledge increased. He saw no reason why names used in Botany should not also be used in Zoology, and agreed with Mr. Hartert, that no practical confusion resulted from this being done. With regard to trinomials, he saw no means of doing without them, but preferred them to be used with the prefix of *var.*, *ab.*, *hybr.*, or *gen.*, so as to indicate, more precisely than could be done without such a prefix, their relation to the species from which they spring. Such prefixes had been employed most properly in Staudinger's catalogue, and their proper use was well understood, though there was some danger of their undue multiplication without sufficient definition. He thought that Dr. Sclater had done a great service to science in raising this discussion, which he hoped would not be allowed to drop without result.

Dr. D. Sharp, F.R.S., said the German Rules were not drawn up in a way to be practically useful. In the case of each one it should have been stated whether it was merely prospective or was intended to be also retrospective in application; and if limited to the former, to what extent neglect of the rule was to disqualify a name. If these points were not agreed on, the adoption of these rules would add to the existing confusion. He further pointed out that the application of the law of priority had in Entomology failed to produce the agreement that its advocates claimed it would promote. Some names had now been in use for generations with two different applications, naturalists being apparently divided into two schools.

Mr. W. T. Blanford, F.R.S., said that nomenclature was simply a matter of convenience, and he thought it hardly worth the labour to draw up another code of rules, because they would be sure to be subject to different interpretations. He objected to the use of

simple trinomials for varieties of animals, and pointed out that, besides geographical races, there were several other kinds of variation which might be designated by prefixing letters to the third name. With regard to ambiguous names, of which Mr. Sclater gave *Lepus timidus* as an example, he was of opinion that Linnæus meant to include both the Mountain Hare of Norway and the Common Hare under this name, and he thought that *Lepus timidus* could be retained for the latter, without causing confusion.

Dr. H. O. Forbes thought that if objection were taken to tautonyms—which were but the logical result of the law of priority—the *generic* and not the *specific* name ought to be changed. The generic portion of a name was liable to change at any time with the increase of our knowledge, and it was evident that, if it became necessary to place the species in some other genus, the law of priority would demand the replacement of that name as its specific designation. The result of this would be that, by change in the *specific* part of a tautonym, there would be a constant liability to change in *both* parts of the appellation of a species.

Mr. W. F. Kirby was of opinion that botanical names should not knowingly be used again in Zoology, and remarked that the German Zoologists were not practically unanimous on this question. He was inclined to think that the 10th edition of the 'Systema Naturæ' was the most logical one to follow. He stated that when preparing his 'Synonymic Catalogue of Diurnal Lepidoptera,' the idea had occurred to him of making Doubleday and Westwood's 'Genera' his starting-point for nomenclature, but he had found this impracticable, and was consequently obliged to revert to the strict law of priority.

The following papers were read:—

1. On the Ornithological Researches of M. Jean Kalinowski in Central Peru. By Graf Hans von Berlepsch and Jean Stolzmann.

[Received January 7, 1896.]

(Plates XIII. & XIV.)

Les trois riches collections envoyées au Muséum Branicki de Varsovie par M. Jean Kalinowski, autrefois explorateur du Kamtschatka et de la Corée, nous permettent de présenter aux lecteurs une liste complète des oiseaux du Pérou central fournis par notre infatigable voyageur[1]. Afin que notre article ne soit pas trop étendu, nous l'avons divisé en deux parties, dont la première contient les familles de *Turdidæ*, *Sylviidæ*, *Cinclidæ*, *Troglodytidæ*,

[1] La liste des oiseaux de la côte péruvienne était publiée par nous dans les P. Z. S. 1892, p. 371 ff.

J.G. Keulemans del et lith. Mintern Bros. imp.

DUBUSIA STICTOCEPHALA.

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MUSEUM

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TYRANNISCUS FRONTALIS.

BRITISH
6 AU 96
MUSEUM

Motacillidæ, *Mniotiltidæ*, *Vireonidæ*, *Hirundinidæ*, *Cœrebidæ*, *Tanagridæ*, *Fringillidæ*, *Icteridæ*, *Corvidæ*, *Tyrannidæ*, *Pipridæ*, *Cotingidæ*, *Dendrocolaptidæ*, *Formicariidæ*, *Pteroptochidæ*; et la seconde, qui sera publiée prochainement, embrassera toutes les familles restantes.

M. Kalinowski, dans l'espace de trois années et demie (1890, 1891, 1892, et une partie de 1893), a exploré la région des hautes Cordillères aux environs de Tarma et du lac Junin, et a ensuite visité la région boisée du versant oriental des Andes, notamment la vallée de Chanchamayo et celle de Vitoc. Toute cette partie du Pérou central avait déjà été explorée par le célèbre naturaliste suisse de Tschudi et par l'excellent explorateur polonais Constantin Jelski, et néanmoins les recherches de Kalinowski ont été suffisamment fructueuses pour nous fournir plus de vingt espèces nouvelles et un grand nombre de sous-espèces non encore décrites. En outre elles ont enrichi l'avifaune péruvienne d'un certain nombre d'espèces, déjà connues, mais qui ont été trouvées pour la première fois sur le territoire du Pérou. Voilà la liste d'espèces nouvelles déjà décrites ou qui seront décrites prochainement par nous d'après des spécimens fournis par Kalinowski :—

1. Dubusia stictocephala, *nobis* *.
2. Buarremon poliophrys, *nobis*.
3. Phrygilus chloronotus, *nobis*.
4. Pseudochloris sharpei, *nobis* *.
5. Spinus olivaceus, *nobis* *.
6. Orchilus albiventris, *nobis* *.
7. Tyranniscus frontalis, *nobis* *.
8. Mitrephanes olivaceus, *nobis* *.
9. Pipra comata, *nobis* *.
10. Siptornis taczanowskii, *nobis* *.
11. —— marayniocensis, *nobis*.
12. Xiphocolaptes phæopygus, *nobis*.
13. Thamnophilus variegaticeps, *nobis*.
14. Dysithamnus dubius, *nobis* *.
15. Myrmotherula longicauda, *nobis* *.
16. —— sororia, *nobis* *.
17. Myrmeciza spodiogastra, *nobis* *.
18. Spathura annæ, *nobis* *.
19. Lesbia juliæ, *nobis* MS.[1]
20. Macropsalis kalinowskii, *nobis* *.
21. Dendrobates va'dizani, *nobis* *.
22. Leptosittaca branickii, *nobis* *.
23. Theristicus branickii, *nobis* *.
24. Podiceps taczanowskii, *nobis* †.

* Espèces décrites par nous dans l'Ibis, 1894, pp. 385–405.
† Décrite dans l'Ibis, 1894, pp. 109–112.

Ajoutons à cette liste les quatre espèces décrites par nous d'après les oiseaux de la première collection Kalinowski (côte du Pérou)[2], à savoir :—

1. Saltator immaculatus, *nobis*.
2. Molothrus occidentalis, *nobis*.
3. Dives kalinowskii, *nobis*.
4. Cinclodes taczanowskii, *nobis*.

Ce qui nous donne 28 espèces nouvelles pour un pays exploré déjà soigneusement par des voyageurs habiles comme MM. de Tschudi et Jelski. Ce résultat inattendu fait honneur à M. Kalinowski.

Parmi les oiseaux fournis par notre voyageur se trouve aussi le type d'un nouveau genre (*Leptosittaca*).

Les espèces connues déjà mais introduites pour la première fois

[1] Pas encore décrite par nous.
[2] *L. c.*

dans la faune péruvienne par les recherches de Kalinowski sont les suivantes:—

1. Odontorhynchus branickii, *Berl. & Tacz.*
2. Spinus sclateri (*Sharpe*)?
3. Pipreola frontalis, *Scl.*
4. Picolaptes fuscicapillus, *Pelz.*
5. Formicivora caudata, *Scl.*, subsp.?
6. Phæolæma cervinigularis, *Salv.*
7. Campophilus pollens (*Bp.*), subsp.
8. Phaëthornis pygmæus (*Spix*), subsp.
9. Heliothrix auriculatus, *Nordm.*
10. Porzana melanophæa (*Vieill.*).
11. Ægialites occidentalis, *Cab.*
12. Phalaropus wilsoni, *Sabine.*
13. Eurypyga major, *Hartl.*

Notre voyageur a donc enrichi l'avifaune péruvienne d'environ quarante espèces.

La contrée explorée par Kalinowski n'est pas très étendue, mais elle présente une extrême variabilité de conditions par suite des différences d'altitude. Ainsi notre voyageur a pu visiter de nombreuses localités situées entre 2600′ au-dessus du niveau de la mer et la limite des neiges perpétuelles. Ces différences d'élévations nous expliquent la grande richesse de l'avifaune de cette contrée.

Pour que nos lecteurs pourraient s'orienter plus facilement, nous allons diviser toutes les localités visitées par Kalinowski en deux groupes: celles situées dans les parties dépourvues de forêts, c'est-à-dire dans les régions de la Sierra et de la Puna et celles situées dans la région des forêts (" montaña " des péruviens).

(*a*) Localités situées dans la région découverte (entre 8000′ et la limite des neiges perpétuelles):—

Chicla—petite ville, station terminale du célèbre chemin de fer de l'Oroya. Chicla est située à une hauteur absolue de 12,300′.

Ingapirca—village au bord du lac Junin nommé aussi la Laguna de Chinchaycocha (12,900′). Dans le voisinage se trouve *Ondores* (environ la même élévation).

Tarma—capitale du département de Junin, 9735′. Le rio de Tarma (qui plus bas prend le nom du rio de Chanchamayo) s'unit à un autre fleuve venant du nord; au confluent de ces deux rivières se trouve la bourgade d'*Acobamba*. Sur la route d'Acobamba à Junin est située la bourgade de *Palcamayo*.

Macabamba et *Hacienda de Queta* se trouvent aux environs de Tarma.

Jauja—ville du département de Junin dans la vallée du fleuve de Jauja. L'élévation moyenne de la vallée aux environs de la ville est évaluée par Paz Soldan à 11,000′.

Il nous a été impossible de trouver dans l'atlas de Paz Soldan les localités de *Baños*, *Canchacso* et *Tapo*, nous pouvons seulement affirmer qu'elles sont situées dans le département de Junin. Kalinowski indique sur les étiquettes que *Baños* est situé à la limite des neiges perpétuelles; pour *Tapo* il évalue la hauteur à 11,000′. *Canchacso* doit être aussi un point très élevé à en juger par la présence du *Cinclodes rivularis*.

(*b*) Localités situées dans la montaña (région de forêts). Nous avons dit que le rio de Tarma prend plus bas le nom de rio de

Chanchamayo. En s'unissant avec le rio de *Vitoc* et celui d'Ocsabamba il forme le fleuve Pérené, qui avec le fleuve Apourimac donne naissance au fleuve Tambo—la souche du fleuve Ucayali. Nous voyons donc que les vallées de Chanchamayo et de Vitoc sont voisines.

Dans la vallée de *Chanchamayo* sont situées les localités suivantes visitées par Kalinowski: *La Merced* (2600′), *La Gloria* (3200′), et *Borgoña* (2600′).

La vallée de *Vitoc*, dans la partie supérieure, s'appelle Rio de Aynamayo, près des sources duquel se trouve une petite ferme nommée *Maraynioc*, très bien connue des naturalistes par l'exploration de M. Jelski, où celui-ci a fait ses plus intéressants découvertes. Maraynioc est situé à la limite supérieure de la forêt, c'est-à-dire de 11,000′ à 12,000′ d'élévation. Dans la même vallée de Vitoc, mais beaucoup plus bas, se trouve une autre ferme —l'*Esperanza*—située d'après Kalinowski à 3500′ d'élévation. Comme stations intermédiaires entre Maraynioc et l'Esperanza sont situées les localités suivantes visitées par Kalinowski:—*Pariayacu*, *Tambo de Aza*, *Sarnapaycha*, *Huarmipaycha*, *Culumachay*, *Puyas-Yacu*, *Chontabamba*, *San Emilio*, *Tendalpata*, *Chilpes* et *Garita del Sol*. Kalinowski désigne les six premières localités par le nom général de "Maraynioc" à cause du voisinage de cette ferme; les cinq autres sont toujours marquées "Vitoc," étant situées dans la vallée de ce nom.

Fam. Turdidæ.

1. Turdus nigriceps, Cab.

La Gloria (août 1890) et Garita del Sol (juillet et août 1891).

La femelle jeune est d'un brun foncé en dessus avec une teinte roussâtre au sommet de la tête et principalement sur le front. Le croupion et les sous-caudales sont d'un ardoisé légèrement teinté de roussâtre. Les côtés de la tête d'un brun roussâtre avec un sourcil postoculaire un peu plus clair à peine visible, les tiges des couvertures auriculaire plus claires ou roussâtres. La gorge striée longitudinalement de brun olive sur un fond blanc roussâtre. La poitrine d'un brun olive roussâtre. Le ventre et l'abdomen d'un blanc grisâtre plus pur au milieu, avec les côtés d'un brun olivâtre. Les sous-caudales d'un blanc roussâtre, bordées sur les côtés d'un gris d'ardoise. Les rémiges et les rectrices noirâtres bordées de brun roussâtre. Les sous-alaires d'un brun olive mélangé de roux-brun clair. Bec noirâtre mélangé de jaunâtre, pattes d'un brun jaunâtre, "iris brun foncé."

♀. Long. totale 233, envergure 354, aile 110, queue 84, bec 25, tarse 29 mm.

Une autre femelle, qui ne paraît pas complètement adulte, a le dessus d'un gris olivâtre foncé, légèrement marbré de noirâtre; le front est un peu plus roussâtre et le croupion plus schistacé que le dos. La gorge d'un blanc roussâtre variée de raies longitudinales noirâtres. Le menton même est blanchâtre uniforme. La poitrine

antérieure et les flancs d'un gris roussâtre, moins roussâtre sur les côtés de l'abdomen ; le milieu de l'abdomen et les régions anales d'un blanc sale ; les sous-caudales grises, chaque plume portant une ligne blanche assez large et cunéiforme le long du rachis. L'aile pliée est de la couleur du dos ; les rémiges sont d'un noir brunâtre, largement bordées de gris sur leurs barbes externes ; les rectrices noirâtres, avec les bordures d'un gris foncé. "Bec brun, pattes d'un jaune brunâtre."

♀. Aile 100, queue 76, culmen 21, tarse 27 mm.

D'après Kalinowski le mâle adulte a le bec jaune à la base, brunâtre dans la partie terminale ; pattes d'un jaune brunâtre.

2. TURDUS PHÆOPYGUS SPODIOLÆMUS, subsp. nov.

Turdus phæopygioides, Tacz. (nec Seebohm) Orn. Pérou, i. p. 490, et iii. p. 508.

T. phæopygo (*Cab.*) e Guiana *simillimus, sed major et gula ad jugulum usque fere omnino nigro-brunnea, marginibus plumarum lateralibus albis tenuissimis distinguendus.* ♂ *al.* 118½, *caud.* 98½, *culm.* 19, *tars.* 28¾ *mm.*

Hab. in Peruvia centrali (Mus. Branicki).

Un mâle adulte de la Gloria du 1 août 1890. "Iris brun foncé ; bec noirâtre, avec la partie basale de la mandibule inférieure d'un jaune olivâtre ; pattes brunes."

L'oiseau envoyé diffère des oiseaux typiques de la Guyane anglaise par des dimensions généralement plus grandes et par la gorge plus uniformement noirâtre, couleur qui est aussi plus étendue en bas. Les plumes noirâtres de la gorge ne présentent qu'une bordure très étroite blanchâtre, tandis que chez la forme typique il y a des bordures larges d'un blanc pur formant des stries régulières. Quant à la couleur des parties supérieures, l'oiseau du Pérou central s'accorde presque entièrement avec la forme typique, tandis que la forme qui habite l'Ecuador oriental, et qui est représentée dans les collections de Bogotá, se distingue par le dos coloré d'un brun saturé ou brun de bistre (*T. phæopygus saturatus*, Berl.).

3. TURDUS IGNOBILIS, Scl.

Trois mâles de La Merced (août 1890 et janvier 1891). "Iris brun foncé, bec et pattes d'un brun corné."

Un mâle comparé aux oiseaux du Pérou septentrional (Chirimoto et Tarapoto) s'accorde dans tous les détails sauf la queue, qui est plus longue chez les oiseaux du Pérou central.

4. TURDUS CHIGUANCO, Lafr. et d'Orb.

Merula chiguanco, Tacz. l. c. i. p. 494.

Deux mâles, dont l'un d'Acobamba (21 septembre 1890) et l'autre de Tarma (13 août 1893). "Iris d'un rouge brique sale, bec et pattes jaunes." Un jeune mâle de Garita del Sol (3 octobre 1891). "Iris brun clair."

Les deux mâles adultes diffèrent de la femelle d'Ica (côte

du Pérou) par la couleur des yeux, du bec et des pattes (voir P. Z. S. 1892, p. 373).

5. TURDUS GIGAS GIGANTODES (Cab.).

Pariayacu: une paire, novembre 1891. "Iris rouge, bec et pattes d'un jaune orangé, bord de la paupière jaune."

6. TURDUS SERRANUS, Tsch.

Un mâle de Maraynioc (7000'), 24 octobre 1892. "Iris rouge cannelle sale, bec et la paupière jaunes, pattes d'un jaune brunâtre."

7. TURDUS SWAINSONI, Cab.

La Gloria et La Merced (janvier 1891): deux mâles et une femelle.

Fam. SYLVIIDÆ.

8. MYIADESTES RALLOIDES (d'Orb.).

Un jeune oiseau de Garita del Sol (24 mars 1893). "Iris brun fonce, pattes brunes, bec noir."

9. MYIADESTES LEUCOTIS (Tsch.).

Garita del Sol: deux mâles, juillet et octobre 1891. "Iris brun foncé, mandibule supérieure et pattes noires, mandibule inférieure couleur de rose jaunâtre."

Fam. CINCLIDÆ.

10. CINCLUS LEUCOCEPHALUS, Tsch.

Deux femelles, dont une de Palcamayo (juillet 1890) et l'autre de Maraynioc (7 juin 1893). "Iris brun foncé."

Fam. TROGLODYTIDÆ.

11. CINNICERTHIA PERUANA (Cab.).

Pariayacu: deux femelles (novembre et décembre 1891), et trois exemplaires de Maraynioc (juillet et août 1892, mars 1893). Iris chez trois exemplaires marqué "rouge-brique," chez deux autres "brun clair." "Bec plombé brunâtre, pattes brunes."

L'une des femelles de Pariayacu (de 12 décembre 1891) possède tout le front jusqu'au bord postérieur des yeux et le tour de l'œil d'un blanc presque pur. Chez une autre de Maraynioc (du 19 mars 1893) le blanc s'étend moins largement sur le front et il est légèrement teinté de fauve. Il est à remarquer que l'apparition du blanc sur le front et autour des yeux se répète souvent chez les autres espèces du genre *Cinnicerthia*, comme par exemple chez la *C. olivascens*, Sharpe (*C. unibrunnea*, Scl. & Salv., *nec* Lafr., voir P. Z. S. 1879, p. 492). Il est difficile de considérer ce caractère sporadique comme un cas d'albinisme, puisqu'il se montre sur différentes parties du corps, tandis que le blanc chez la *Cinnicerthia*

occupe toujours soit le front, soit le tour des yeux, soit les deux parties ensemble. Il se pourrait que ce soit un retour vers un caractère possédé jadis par quelque ancêtre de la *Cinnicerthia*.

Une jeune femelle de Maraynioc (13 août 1892) possède le dessous du corps, surtout la gorge, beaucoup plus claire que les autres exemplaires. Le front chez elle est largement d'un gris cendré, qui s'étend sous forme d'un très large sourcil jusqu'à la nuque. Cet exemplaire possède en outre les raies noires de la queue beaucoup moins nombreuses (à peu près 27) que les autres (à peu près 36). "Iris brun."

12. HENICORHINA LEUCOPHRYS (Tsch.).

Garita del Sol: deux mâles et une femelle, juin et juillet 1891. "Iris brun foncé, bec noir, pattes brunes."

La différence indiquée par Taczanowski entre une femelle de Sillapata (Pérou central) et des individus de Tambillo (Pérou du Nord) ne paraît pas constante. Nos oiseaux de Vitoc ont les rémiges et les rectrices aussi distinctement rayées que les oiseaux de l'Ecuador occidental et de Bogotá. Il n'y a non plus de différences dans les dimensions.

13. THRYOTHORUS CANTATOR, Tacz.

La Merced et La Gloria: deux femelles, juillet 1890 et avril 1891. "Iris brun jaunâtre, bec brun bleuâtre, pattes d'un gris brunâtre."

Ces deux exemplaires s'accordent en tout avec l'oiseau typique du Musée Universitaire de Varsovie.

14. TROGLODYTES FRATER, Sharpe.

T. solstitialis, Tacz. P.Z.S. 1874, p. 505; id. Orn. Pérou, i. p. 521.

T. solstitialis frater, Sharpe, Cat. B. Brit. Mus. vi. p. 261.

Maraynioc: un mâle et deux jeunes oiseaux, octobre et décembre 1891 et août 1892. "Iris brun foncé, bec brun avec la mandibule inférieure blanchâtre, pattes d'un brun carné." Ces oiseaux, quant aux dimensions, s'accordent avec le *T. frater* de la Bolivie, mais ils présentent la strie sourcilière d'un blanc plus roussâtre.

15. TROGLODYTES MUSCULUS AUDAX (Tsch.).

T. audax, Tacz. Orn. Pérou, i. p. 525.

La Merced: deux femelles, août 1890 et février 1891. "Iris brun foncé, bec brun en dessus, brun grisâtre en dessous; pattes d'un brun grisâtre."

Cet oiseau se rapproche surtout de la forme du *T. musculus* qui habite la Guyane anglaise, et ne s'en distingue que par le bec un peu plus court et la queue plus longue. Les flancs présentent une légère indication de stries transversales, qu'on ne voit pas chez les oiseaux de la Guyane.

♀. Aile 52, queue 44, culmen 12¾, tarse 18½ mm.

C'est probablement le *T. audax* de Tschudi, qui habite, dit-on, la

région des forêts du Pérou nord-oriental; mais il faudrait examiner le type du *T. audax* dans le Musée de Neuchâtel.

16. TROGLODYTES MUSCULUS PUNA, subsp. nov.

T. audax, Tacz. Orn. Pérou, i. p. 525 (partim).

T. musculo *e* Bahia *simillimus, sed multo major et colore subtus omnino rufescente, subcaudalibus minime nigro maculatis; pedibus fortioribus et nigrescentioribus.*

Hab. in Peruvia alta.

♂ ad. Long. totale 142–145, envergure 193–195, aile 60–59½, queue 51–49½, culmen 15¾–14¼, tarse 21½–20¾ mm.

Ingapirca: deux mâles (mai et juin 1890); un mâle et une femelle de l'hacienda de Queta (juillet et août 1892 et 1893). "Iris brun foncé."

Cette forme est proche du *T. musculus*, Naum., de Bahia, mais s'en distingue par sa taille considérablement plus forte, par la couleur roussâtre du dessous du corps plus uniformément répandue, par le manque absolu de taches noires sur les sous-caudales et par les pattes plus fortes et plus noirâtres.

17. CISTOTHORUS GRAMINICOLA, Tacz.

Ingapirca: trois mâles du mai et du juin 1890. "Iris brun foncé."

Ces oiseaux, comparés aux types du Musée Universitaire de Varsovie trouvés par M. Jelski aux environs de Maraynioc, présentent quelques différences bien marquées. La taille en général est plus forte chez les oiseaux d'Ingapirca, la queue surtout est plus longue. Les stries du pileum sont mieux prononcées et d'une couleur roussâtre au lieu de grisâtre. Les stries de la face supérieure de la queue sont plus larges. La couleur du dessus du corps est en général plus claire et plus roussâtre. La couleur roussâtre des côtés du corps et de la poitrine moins développée et plus pâle que chez les oiseaux de Pumamarca et de Maraynioc.

Dimensions:—

	Maraynioc.	Pumamarca.	Ingapirca.		
	♂.	♂.	♂.	♂.	♂.
Aile	48	47	54	52	49 mm.
Queue	45	41	56	53½	53 „
Culmen ..	11	11½	12	12	11½ „
Tarse	20	20	19	19	18 „

Nous n'avons pas eu l'occasion de comparer nos oiseaux à des exemplaires typiques du *C. polyglottus* (Vieill.) du Paraguay.

18. ODONTORHYNCHUS BRANICKII, Berl. et Tacz.

Garita del Sol: un mâle adulte du 22 juillet 1891. "Iris brun foncé, bec et pattes bruns."

Al. 63, caud. 56, culm. 13¾, tars. 16½ mm.

S'accorde parfaitement avec les oiseaux typiques de l'Ecuador

oriental du Musée Branicki à Varsovie, sauf que les ailes et la queue sont un peu plus longues.

Espèce nouvelle pour la faune péruvienne.

Fam. Motacillidæ.

19. Anthus furcatus brevirostris (Tacz.).

A. furcatus, Tacz. Orn. Pérou, i. p. 459.

Ingapirca: deux paires, juin 1890. "Iris brun foncé."

Berlepsch, ayant eu l'occasion de comparer les oiseaux d'Ingapirca à une belle série de 13 individus de l'*Anthus furcatus* typique de Valle Grande en Bolivie (coll. Garlepp), a pu constater que les oiseaux du Pérou central diffèrent constamment par le blanc des rectrices externes plus étendu, par les taches de la poitrine plus larges et plus intenses, par le bec plus mince et par le queue un peu plus courte. On pourrait donc les distinguer comme *A. furcatus brevirostris* (Tacz.).

20. Anthus calcaratus, Tacz.

A. correndera, Tacz. Orn. Pérou, i. p. 458.

Junin: nombreux individus, mai et juin 1890. "Iris brun foncé, bec noirâtre avec la base de la mandibule inférieure carnée, pattes d'un carné sale."

Berlepsch avait déjà démontré, en commun avec le Dr. Leverkühn (Ornis, 1890, p. 8), que l'*A. calcaratus*, Tacz., diffère constamment de l'*A. correndera* du Chili par la couleur de la rectrice externe de chaque côté, qui est presque entièrement blanche (sauf une bordure étroite noirâtre à la partie basale de la barbe interne), par le fond de la couleur du dessus du corps plus ochreux et par le dessous du corps plus jaunâtre, enfin par le bec et les tarses plus longs.

21. Anthus bogotensis, Scl.

Une paire de Maraynioc, 15 août et 20 septembre 1892.

La seule différence appréciable entre les oiseaux du Pérou et ceux de l'Ecuador se voit dans la longueur du bec (un peu plus court chez les oiseaux du Pérou). Un oiseau de Bogotá du Musée Berlepsch (*A. bogotensis* typique) diffère des oiseaux de l'Ecuador et du Pérou par le manque absolu du bord interne noirâtre de la rectrice externe.

Fam. Mniotiltidæ.

22. Compsothlypis pitiayumi (Vieill.).

Garita del Sol: une femelle, 24 avril 1893.

23. Dendroica cærulea (Wils.).

La Gloria: un exemplaire du janvier 1891. San Emilio: une femelle, 14 mars 1893.

24. Dendroica blackburniæ (Gm.)

Une femelle et un oiseau sans indication de sexe de Garita del Sol du mars 1893.

25. Dendroica æstiva (Gm.).

La Merced : un mâle du 26 février 1891. "Iris brun foncé, bec brun plombé, pattes olivâtres."

26. Basileuterus luteoviridis striaticeps (Cab.).

Myiothlypis striaticeps, Cab. Journ. f. Orn. 1873, p. 316.
B. luteoviridis, Tacz. Orn. Pérou, i. p. 477.

Maraynioc : deux mâles et une femelle (juillet, août et novembre 1892). Garita del Sol : un mâle (juillet 1891).

Les oiseaux du Pérou central et de la Bolivie se distinguent des oiseaux typiques de Bogotá par les stries foncées latérales du piléum beaucoup plus prononcées que chez le vrai *B. luteoviridis*.

27. Basileuterus bivittatus chrysogaster (Tsch.).

B. bivittatus, Tacz. Orn. Pérou, i. p. 473.

La Merced : deux femelles, octobre 1890. "Iris brun foncé."

Les oiseaux du Pérou central se distinguent des exemplaires typiques de la Bolivie par les dimensions plus petites et par des détails de la coloration, à savoir : le vert du dessus du corps est un peu plus pâle ou plus jaunâtre ; les stries bordant le roux du milieu de la tête sont d'un noirâtre moins foncé ou plus brunâtre. Les plumes au commencement du front sont verdâtres au lieu de noirâtres ; le milieu de l'occiput est d'un vert plus jaunâtre que celui du dos, ce que n'est pas le cas chez le vrai *B. bivittatus* ; la strie surcilière est d'un jaune verdâtre plus clair, et prolongée jusqu'au dessus des oreilles. On pourrait même élever cette forme au rang d'espèce.

Dimensions : ♀ ♀ : aile 59–61½, queue 52, culmen 10¾–11¼, tarse 18¾–19½ mm.

28. Basileuterus coronatus (Tsch.).

Garita del Sol : une femelle, juillet 1891. "Iris brun foncé, bec noir, pattes d'un brun olivâtre."

29. Basileuterus uropygialis poliothrix, subsp. nov.

B. uropygialis[1], Tacz. Orn. Pérou, i. p. 478 (partim).

B. uropygiali, *Scl.*, *simillimus*, *differt pileo usque ad nucham*

[1] Le type du *B. uropygialis*, Scl., est dit être du Brésil, et peut-être cette indication de localité est-elle correcte. Berlepsch a eu l'occasion d'examiner dans le Musée de Munich le type de la *Muscicapa fulvicauda*, Spix (Av. Bras. ii. p. 20, tab. xviii. fig. 2), qui venait de l'Amazone brésilien, et a reconnu que c'est un *Basileuterus* identique au *B. uropygialis*, Scl., ou très voisin. Il est donc bien probable que *fulvicauda*, Spix, est un nom plus ancien pour le *B. uropygialis*, Scl., mais il faut encore une réexamination et une comparaison du type de la *M. fulvicauda* avec les individus du *B. uropygialis*.—Berl. et Stolzm.

pure ardesiaco nec brunneo mixto, colore dorsi olivaceo etiam clariore. Ala 68½–66, *cauda* 56¾–49½, *culmen* 12–11¾, *tarsus* 23½–20¾ *mm.*

La Gloria (août) et La Merced (octobre 1890): deux mâles. "Iris brun foncé."

Les deux oiseaux de Chanchamayo diffèrent d'un autre de l'Ecuador oriental du Musée Berlepsch et d'une femelle de Huambo, Pérou nord-est (coll. Stolzmann), du Musée Branicki par la couleur du dessus de la tête, qui est d'un ardoisé plus clair ou moins brunâtre, et qui est plus étendu vers la nuque. Chez les oiseaux de l'Ecuador oriental et du Pérou septentrional les plumes du dessus de la tête présentent des taches brunâtres à la pointe qui manquent complètement aux oiseaux de Chanchamayo. Le dos est d'un vert olive un peu plus clair.

30. SYLVANIA CANADENSIS (L.).

Myiodioctes canadensis, Tacz. Orn. Pérou, i. p. 468.

La Gloria et La Merced (décembre et janvier): deux femelles.

31. SETOPHAGA VERTICALIS, Lafr. et d'Orb.

La Gloria: une femelle, août 1890. Garita del Sol: deux mâles, août 1891, et une femelle, 23 avril 1893. "Iris brun foncé."

Un œuf de cette espèce fourni par M. Kalinowski est ové, attenué graduellement vers le petit bout. Le fond est d'un blanc pur, couvert d'une fine moucheture plus dense sur le gros bout, où elle forme une couronne. Les macules sont de différentes couleurs: celles de la gamme inférieure sont d'un roux pâle et en général elles sont plus grosses que celles de la gamme supérieure, qui sont d'un roux brunâtre assez foncé. Il y a aussi une certaine quantité de petites taches d'un cendré assez foncé rassemblées surtout au gros bout. Dimensions: 18¼×13 mm.

32. SETOPHAGA MELANOCEPHALA, Tsch.

Garita del Sol et Marayniоc (octobre et novembre 1891). Vitoc (mai 1893).

Fam. VIREONIDÆ.

33. VIREOSYLVIA JOSEPHÆ, Scl.

Garita del Sol: un mâle, 2 septembre 1891.

34. CYCLORHIS GUIANENSIS (Gm.).

La Gloria: un mâle, août 1890. "Iris d'un jaune orangé."

Al. 72½, caud. 56½, culm. 17½, tars. 21 mm.

Cet oiseau s'accorde parfaitement avec des individus de la Guyane anglaise. Les pieds paraissent d'une couleur plus pâle.

Fam. HIRUNDINIDÆ.

35. HIRUNDO ERYTHROGASTRA, Bodd.

La Merced: une jeune femelle, 10 mars 1891.

36. TACHYCINETA ALBIVENTRIS (Bodd.).

Hirundo albiventris, Tacz. Orn. Pérou, i. p. 239.

La Merced: une paire d'oiseaux jeunes, 10 janvier et 20 août 1891. "Iris brun foncé."

Ces oiseaux se distinguent des individus de Cayenne par le blanc des barbes internes des rectrices externes plus étendu vers la pointe.

37. ATTICORA FASCIATA (Gm.).

La Merced; trois individus, juillet et août 1890. "Iris brun foncé."

Un mâle examiné par Berlepsch est plus petit que les oiseaux de la Guyane anglaise, de Trinidad et de l'Ecuador oriental dans sa collection. Le bec paraît aussi plus petit, la bande de la poitrine plus large, que chez les oiseaux de la Guyane anglaise. Le type de l'*A. fasciata* venait de Cayenne.

38. ATTICORA CYANOLEUCA (Vieill.).

La Merced: nombreux individus du juillet 1890. "Iris brun foncé."

39. ATTICORA MURINA (Cass.).

A. cinerea, Tacz. Orn. du Pérou, i. p. 243.

Acobamba: un mâle du 11 juillet 1890. "Iris brun foncé."

Al. 112½, caud. 64½, culm. 6½, tars. 10½, caud. furcata 14½ mm.

Bec plus étroit, parties supérieures, surtout le pileum, plus verdâtres, et parties inférieures plus grisâtres, moins brunâtres que chez les oiseaux de l'Ecuador comparés par nous.

40. ATTICORA ANDECOLA (Lafr. et d'Orb.).

Hirundo andecola, Lafr. et d'Orb. Syn. av. (1837) p. 69 (typ. ex La Paz, Bolivia); Tschudi, F. P. Orn. p. 132; Tacz. Orn. du Pérou, i. p. 242.

Atticora cinerea (partim), Sharpe, C. B. Brit. Mus. x. p. 184 ("young").

Une paire d'oiseaux adultes de l'hacienda de Queta, près de Tarma, 25 décembre 1892. "Iris brun foncé, presque noir; bec noir, pattes carnées."

	Long. tot.	Al.	Caud.	Culm.	Tars.	Caudæ furca.
♂	130	123½	60½	7½	13	6 mm.
♀	128	116½	55	7¼	12	4¾ „

Dr. Sharpe a eu tort de réunir l'*A. andecola*, Lafr. et d'Orb., à l'*A. murina* (Cass.) (=*A. cinerea* auct., nec Gm.). Ce sont évidemment deux espèces tout-à-fait distinctes.

Nos deux oiseaux de Tarma s'accordent parfaitement avec la description donnée par Lafresnaye et d'Orbigny de leur *H. andecola* (*l. c.*), de même qu'avec deux individus recueillis par G. Garlepp à Chililaya, lac Titicaca.

Ils diffèrent de l'*A. murina*, Cass., de l'Ecuador et d'Acobamba, par la queue très peu fourchue (l'échancrure mesurant de 5 à 6½ au lieu de 19 mm.), par les rectrices plus larges, les tectrices sous-caudales beaucoup plus prolongées, les ailes plus longues, enfin par la coloration du dessous du corps. Chez l'*A. murina* toutes les parties inférieures du corps sont d'une couleur grise brunâtre uniforme, tandis que chez l'*A. andecola la gorge est d'un noirâtre enfumé, la poitrine et l'abdomen néanmoins d'un blanchâtre sale.* Les tectrices sous-caudales chez l'*A. andecola* sont d'un brunâtre pâle à bordures apicales blanchâtres, tandis que chez l'*A. murina* elles sont noirâtres, terminées d'une tache d'un bleu d'acier à la pointe. Les parties supérieures sont d'un bleu d'acier verdâtre moins vif, surtout sur la tête.

41. ATTICORA TIBIALIS (Cass.).

La Gloria: un mâle en mue et une jeune femelle, 6 août 1890. "Iris brun foncé."

42. STELGIDOPTERYX RUFICOLLIS (Vieill.).

La Merced: trois exemplaires, juillet, août et septembre 1890. "Iris brun foncé."

Fam. CŒREBIDÆ.

43. DIGLOSSA PECTORALIS, Cab.

Plusieurs exemplaires de Maraynioc (juillet, novembre et décembre 1891, août 1892, janvier et mars 1893). "Iris brun foncé, bec et pattes noirs."

44. DIGLOSSA PERSONATA (Fras.).

Maraynioc et Garita del Sol (septembre et novembre 1891, juillet et décembre 1892).

45. DIGLOSSA BRUNNEIVENTRIS, Lafr.

Nombreux individus de Palcomayo et d'Acobamba (juillet 1890), de Maraynioc et de Tarma (novembre 1891, août 1892, et février–juillet 1893). "Iris brun foncé."

Nos oiseaux du Pérou central diffèrent d'un mâle de Paucartambo du Musée Berlepsch en ce qu'ils ne présentent que des traces de stries surcilières grisâtres, qui sont bien prononcées chez le dernier.

46. DIGLOSSOPIS CÆRULESCENS PALLIDA, subsp. nov.

D. cærulescens, Tacz. (nec Scl.) P. Z. S. 1874, p. 511 (Ninabamba); id. P. Z. S. 1879, p. 225 (Palto & Tambillo); id. P. Z. S. 1882, p. 8 (Chachapoyas, Tamiapampa, Achamal); id. Orn. du Pérou, i. p. 422.

D. cærulescenti (*Scl.*) *simillima, sed colore supra subtusque multo pallidiore, gula, pectore, lateribusque corporis pallide*

cærulescenti-griseis nec saturate ultramarino-ardesiacis distinguenda.

Hab. in Peruvia alta, centrali et septentrionali.

	Long. tot.	Al.	Caud.	Culm.	Tars.
♂ ♂ Chachapoyas (Muséum H. v. Berl.)	124, 129	72, 73½	58½, 65	13½, 12⅔	20½ mm.
♀ Chirimoto (Muséum H. v. Berl.)	124	69	57	13½	20 „
♂ Garita del Sol (Muséum Branicki)	124½	64½	52½	12⅔	20½ „

Un mâle de Garita del Sol du 7 septembre 1891.

Feu le docteur Taczanowski avait déjà démontré dans son 'Ornithologie du Pérou' (*l. c.*) que les individus péruviens de *Diglossopis* diffèrent des *Diglossopis cærulescens* typiques par la couleur du corps généralement plus pâle, surtout dans les parties inférieures. Cette différence paraît tout-à-fait constante et se manifeste principalement dans la couleur de la gorge, du haut de la poitrine et des côtés du corps, qui est d'un gris bleuâtre à peine plus obscur que le milieu de l'abdomen, au lieu d'un bleu ardoisé obscur comme chez la *D. cærulescens* typique de Vénézuela. Les tectrices sous-caudales sont plus largement bordées de blanc, le milieu de l'abdomen plus largement blanchâtre; enfin, les parties supérieures d'un ardoisé bleuâtre plus pâle et plus terne.

Il est remarquable que le genre *Diglossopis* n'avait pas, jusqu'à présent, été trouvé dans la république de l'Ecuador.

47. Conirostrum cyaneum, Tacz.

Marayniоc: quatre exemplaires, novembre 1891, août et septembre 1892. "Iris brun foncé, bec et pattes noirs."

Un exemplaire du *C. sitticolor*, Lafr., de San Rafael (Ecuador), du Musée Branicki, présente des traces d'un sourcil bleu.

48. Conirostrum ferrugineiventre, Scl.

Marayniоc: deux paires, août 1892. "Iris brun foncé, bec et pattes noirs."

49. Conirostrum atrocyaneum, Lafr.

Garita del Sol (juillet 1891 et mars 1892); Culumachay (août 1892). Le mâle adulte de Garita a le dos supérieur plus noirâtre, moins lavé de bleu violacé, les parties inférieures d'un noir moins bleuâtre, et les dimensions un peu moindres qu'un mâle adulte de Tamiapampa, Pérou du nord.

50. Conirostrum cinereum, Lafr. et d'Orb.

Tarma: un mâle du 15 décembre 1890; Pariayacu: trois exemplaires, août 1892. "Iris brun foncé." Ces oiseaux sont tout-à-fait identiques à des individus recueillis par Garlepp sur le versant oriental des Andes de la Bolivie occidentale [1].

[1] Les oiseaux du littoral du Pérou (Lima, Arequipa) nommés par nous *C. cinereum* (voir P. Z. S. 1892, p. 374) se distinguent de ceux de l'orient du

51. Xenodacnis parina, Cab.

Maraynioc: cinq individus, octobre et novembre 1891, et un mâle, 28 août 1892. "Iris brun foncé, bec noir, pattes brunes."

52. Dacnis cayana glaucogularis, subsp. nov.

D. cayana, Tacz. Orn. Pérou, i. p. 428.

♂ *huic* D. cayanæ *simillimus, sed differt gulæ nigredine magis restricta necnon plumarum apicibus cyaneo-virescentibus.* ♀ *a femina* D. cayanæ *gulæ plumis griseis cæruleo marginatis distinguenda.*

Hab. in Peruvia, Ecuadoria et Columbia.

La Gloria (août) et La Merced (août et septembre 1890): quatre exemplaires. "Iris chez le mâle rouge, chez la femelle d'un brun rougeâtre. Pattes carnées."

C'est la forme occidentale de la *D. cayana*, qui se distingue de la forme typique de Cayenne par le noir de la gorge du mâle plus restreint et mélangé d'un vert bleuâtre aux bords des plumes. Chez le mâle de la Guyane le noir de la gorge est plus intense et presque uniforme. La même différence se voit entre les femelles

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Pérou et de la Bolivie par le piléum d'un gris cendré presque semblable à celui du dos, au lieu d'être sensiblement plus noirâtre. En outre, chez les premiers la strie surcilière est plus courte et s'arrête un peu en arrière de l'œil, tandis que chez l'oiseau typique elle est prolongée jusqu'aux côtés de l'occiput. Enfin, chez les oiseaux de l'occident les parties inférieures du corps et les côtés de la tête sont d'une couleur plus claire et plus roussâtre, la gorge et la poitrine jamais lavée d'un gris cendré comme chez l'oiseau de l'orient. Les oiseaux de Lima ont aussi les dimensions généralement un peu moindres, surtout la queue plus courte.

MM. Lafresnaye et d'Orbigny ont décrit le *Conirostrum cinereum* comme habitant de "Yungas, rep. Boliviana, et Tacna, rep. Peruviana," mais leur diagnose s'applique évidemment à la forme de l'orient, car on y lit: "Supra totum schistaceo-cinereum, 'pileo, alis, caudaque nigris,' subtus pallide cinerascens, abdomine medio anoque pallide." Nous nous pensons donc autorisés à décrire la forme du littoral comme sous-espèce nouvelle:

Conirostrum cinereum littorale, subsp. nov.

C. cinereum, Berl. et Stolzm. P. Z. S. 1892, p. 374 (Lima).

C. C. cinereo (*ex Bolivia or. et Peruv. or.*) *simillimum, sed paula minor, cauda imprimis breviore, pileo cinereo dorso concolore, nec plus minusve nigrescente lavato, stria superciliari breviore, necnon corpore subtus magis fulvescente tincto, jugulo pectoreque haud griseo perfusis distinguendum.*

Hab. in Peruvia littorali, circum Lima et Arequipa.

Mus. Branicki (typus ex Lima) et Berlepsch.

	Al.	Caud.	Culm.	Tars.
C. cinereum littorale ♂♂ Lima.	60, 56½	50, 46	10½, 9½	18½, 16¾ mm.
C. cinereum: 1. ad. Bolivia (coll. Garlepp).	61½	53½	10½	18½ ,,
2. ♂♂ ad. Tarma et Maraynioc	61½	55½	10, 9½	18½, 17½ ,,
3. ♀♀ Maraynioc	...61½, 60½	52¾, 51¾	10¾, 10	19½, 18½ ,,

des deux formes. La femelle de la *D. cayana* typique a la gorge d'un blanc grisâtre presque uniforme, tandis que la femelle de la *D. cayana glaucogularis* présente des bords bleuâtres aux plumes.

L'oiseau du Pérou central pourrait être considéré comme type de la *D. cayana glaucogularis*, parce qu'il a la gorge plus mélangée de bleuâtre que les individus du Haut-Amazone et de Bogotá. Notons aussi que l'oiseau du Pérou central a le bec plus long et plus fort que les oiseaux des localités plus septentrionales ; il a aussi les ailes et la queue plus longues que les oiseaux de l'Amazone supérieur, mais les individus de Bogotá les ont en général encore plus longues.

Dimensions :—

	La Merced.				Huambo.		Yurimaguas.		
	♂.	♂.	♀.	♀.	♂.	♀.	♂.	♂.	
Aile	67	66½	63	63	64	61½	63	62	mm.
Queue ..	49½	45	47	49	50	47	43½	42	„
Culmen ..	13	13	13	13½	12	14	12¼	12¼	„
Tarse	15	15	14	15	14	15	15	14	„

53. DACNIS ANGELICA (de Filippi).

La Merced (août et septembre 1890), Borgoña (avril 1891), Garita del Sol (avril 1892). "Iris jaune."

Les individus du Pérou central s'accordent tout-à-fait avec les oiseaux typiques de Bogotá.

54. ARBELORHINA CÆRULEA MICRORHYNCHA (Berl.).

Cœreba cærulea, Tacz. Orn. Pérou, i. p. 437.

La Merced : trois mâles, septembre 1890. "Iris brun foncé, pattes jaune pâle."

Ces oiseaux s'accordent avec les spécimens de Bucaramanga et de Bogotá nommés *A. cærulea microrhyncha*. Ils ne diffèrent que par la nuance des parties inférieures, qui paraît un peu plus claire.

55. CŒREBA CHLOROPYGA (Cab.).

Certhiola peruviana, Tacz. (nec Cab.) Orn. Pérou, i. p. 439, part.

La Merced : deux mâles du septembre 1890. "Iris brun foncé."

Al. 63½, caud. 37½, culm. 12½, tars. 15¾ mm.

Ces oiseaux ne diffèrent de la *C. chloropyga* typique de Bahia que par les ailes plus longues et le dos un peu plus obscur. Ils sont presque identiques à ceux de la Bolivie. La *C. peruviana*, Cab., basée sur un oiseau à miroir blanc, recueilli par Warszewicz, est peut-être la même que la *C. magnirostris*, Tacz.

56. CHLOROPHANES SPIZA CÆRULESCENS (Cass.).

Ch. atricapilla, Tacz. Orn. Pérou, i. p. 435.

La Merced (août 1890, janvier et mars 1891) et Borgoña (juin

1891): cinq mâles. "Iris rouge sale, mandibule inférieure jaune olivâtre."

57. CHLOROPHANES PULCHERRIMA STIGMATURA, subsp n.

Dacnis pulcherrima, Tacz. Orn. Pérou, i. p. 432.

♂ *mari* Ch. pulcherrimæ, *Scl.*, *simillimus*, *sed differt macula alba magna subterminali in pogonio interno rectricis externæ.* "*Iride fusco-brunnea.*"

Hab. in Peruvia centrali (Garita del Sol).

♂. Al. 70, caud. 46½, culm. 12½, tars. 17½ mm.

Garita del Sol: deux mâles adultes, juillet et août 1891. Les oiseaux du Pérou central se distinguent par une grande tache blanche subterminale sur la barbe interne de la rectrice externe, qui est remplacée, chez les exemplaires de l'Ecuador et de Bogotá, par une fine bordure blanche à la même place.

Nous nous sommes permis de placer la *Dacnis pulcherrima* dans le genre *Chlorophanes*! La forme et la coloration du bec sont presque les mêmes, et il y a une certaine analogie dans la coloration du plumage.

Fam. TANAGRIDÆ.

58. PROCNIAS TERSA OCCIDENTALIS (Scl.).

P. occidentalis, Tacz. Orn. du Pérou, ii. p. 437.

Un mâle adulte de San Emilio, Vitoc, 1892.

Al. 85, caud. 51, culm. 10½, tars. 15¾ mm.

Cet individu s'accorde dans tous les détails avec les oiseaux de la Colombie.

59. CHLOROPHONIA TORREJONI, Tacz.

Garita del Sol: une femelle, 8 novembre 1892.

60. EUPHONIA NIGRICOLLIS (Vieill.).

Garita del Sel (juillet 1891) et Chontabamba (août 1891): trois mâles.

Ces oiseaux sont identiques aux spécimens du Brésil mérid. du Musée Berlepsch.

61. EUPHONIA CHRYSOPASTA, Scl. et Salv.

La Merced (août et septembre 1890) et Borgoña (juin 1891): cinq exemplaires. "Iris brun foncé, la base du bec et les pattes d'un olive bleuâtre."

Ces oiseaux s'accordent en général avec les spécimens de Bogotá du Musée Berlepsch, néanmoins ils présentent des couleurs un peu plus vives et plus claires et des dimensions un peu plus fortes.

62. EUPHONIA XANTHOGASTRA, Sundev.

La Merced: deux mâles, août et septembre 1890; Garita del Sol (novembre 1891). "Iris brun foncé."

63. EUPHONIA LANIIROSTRIS, Lafr. et d'Orb.

La Merced: trois exemplaires, septembre 1890. "Iris brun foncé."

Espèce non comprise dans 'l'Ornithologie du Pérou' par L. Taczanowski, mais trouvée déjà par Mr. Whitely à Marassura (Pérou sud-est).

Un mâle adulte examiné par Berlepsch (al. 66½, caud. 39¾, culm. 10½, tars. 15 mm.) se distingue d'un mâle adulte recueilli par Garlepp à Omeja, Bolivie occid., par le bleu d'acier des parties supérieures moins violâtre, par le jaune orangé du front et des parties inférieures plus pâle, le jaune du front un peu plus étendu en arrière et le bord noirâtre du menton plus large. La *E. crassirostris*, Scl., de la Colombie se distingue aisément par le manque complet des plumes noirâtres au menton, par le jaune des parties inférieures et du front plus pâle, moins orangé, et par le blanc moins répandu sur les rectrices extérieures.

64. EUPHONIA CHLOROTICA SERRIROSTRIS (Lafr. et d'Orb.).

La Merced: trois individus, août et septembre 1890. "Iris brun foncé."

65. EUPHONIA RUFIVENTRIS (Vieill.).

La Gloria: un mâle, 3 août 1890. "Iris brun foncé."

Al. 59½, caud. 33½, culm. 10½, tars. 15½ mm.

Cet oiseau ne se dististingue des individus de l'Ecuador oriental du Musée Berlepsch que par le bleu d'acier des parties supérieures et de la gorge plus verdâtre, moins violacé, et par cette couleur plus étendue vers la poitrine.

66. CALLISTE CHILENSIS (Vig.)[1].

Calliste yeni, Tacz. Orn. Pérou, ii. p. 457.

La Merced: nombreux exemplaires, août et septembre 1890. "Iris brun foncé."

Ces oiseaux s'accordent avec des spécimens d'Iquitos (Amazone sup.), mais ils ont les ailes, la queue et le bec un peu plus longs. Les couleurs sont un peu plus vives.

67. CALLISTE SCHRANKI (Spix).

La Gloria (août 1890 et janvier 1891) et La Merced (1890): nombreux individus. "Iris brun foncé."

68. CALLISTE XANTHOGASTRA ROSTRATA, subsp. nov.

La Merced: trois spécimens (août et septembre 1890), et de La Gloria (janvier 1891). "Iris brun foncé."

♂ ♂. Al. 65¾, 65¼; caud. 45½, 43½; culm. 11¾, 11¼; tars. 17, 15¾ mm.

Deux mâles examinés par Berlepsch ont les ailes, la queue et le

[1] Quoique cette espèce ne se trouve pas sur le territoire chilien, il faudra accepter le nom *chilensis* comme plus ancien.—BERL. et STOLZM.

bec plus longs que les oiseaux de l'Ecuador et de Bogotá. On pourrait peut-être distinguer la forme du Pérou central sous le nom de *C. xanthogastra rostrata*.

69. Calliste punctulata, Scl. et Salv.

Garita del Sol: une paire, mars 1893. "Iris brun foncé, mandibule supérieure noire, mandibule inférieure et pattes d'un plombé bleuâtre."

♂. Al. 66½,	caud. 47½,	culm. 11½,	tars. 17¾ mm.
♀. „ 63,	„ 47¾,	„ 10½,	„ 16½ „

Probablement les oiseaux trouvés par Tschudi dans la région boisée du Pérou oriental et cités par lui (Fauna Per. ii. p. 203) et par Taczanowski (Orn. Pérou, ii. p. 460) comme *C. punctata* (L.) appartiennent-ils à cette espèce.

70. Calliste pulchra (Tsch.).

La Gloria (janvier et février 1891) et Garita del Sol (août 1891): trois mâles et une femelle. "Iris brun foncé, bec noir, pattes d'un plombé bleuâtre."

71. Calliste gyroloides (Lafr.).

La Merced (août et septembre 1890), La Gloria (février 1891), et Garita del Sol (juillet 1891): nombreux individus. "Iris brun foncé."

Berlepsch a comparé un mâle et une femelle à des spécimens de Bogotá. Les oiseaux du Pérou central ont les ailes et la queue un peu plus courtes et le brun du dessus de la tête un peu plus pâle et plus terne. Ces mêmes exemplaires comparés par Stolzmann avec un mâle de Chimbo (Ecuador occ.) présentent des différences bien marquées: l'aile est plus courte de 8 mm., le demi-collier nucal mieux prononcé, la couleur bleue du dessous plus vive chez les oiseaux du Pérou central que chez les spécimens de l'Ecuador.

72. Calliste fulvicervix, Scl. et Salv.

Garita del Sol: deux paires du juillet et d'août 1891. "Iris brun foncé, bec noir, pattes d'un plombé bleuâtre."

Nous n'avons pas eu l'occasion de comparer nos oiseaux aux types boliviens, mais nous avons remarqué qu'ils présentent plusieurs différences comparés à la figure de MM. Sclater et Salvin (voir P. Z. S. 1876, planche xxx.).

73. Calliste argentea (Tsch.).

Garita del Sol: trois paires, juillet, août et septembre 1891. "Iris brun foncé, bec noir, pattes d'un plombé brunâtre."

74. Calliste boliviana (Bp.).

La Merced: deux paires, juillet et septembre 1890. "Iris brun foncé."

75. Calliste nigricincta (Bp.).

La Merced (septembre 1890) et Borgoña (avril et mai 1891) : trois mâles et une femelle. "Iris brun foncé."

Les spécimens du Pérou central diffèrent de ceux de l'Ecuador et de Roraïma (Guyane anglaise) en ayant les ailes et la queue plus longues. Le bleu du croupion et des scapulaires est beaucoup plus intense, les côtés de l'abdomen plus lavés de bleu, les rémiges primaires bordées de bleu au lieu de bleu verdâtre, la gorge plus lavée de lilacé.

Dimensions des oiseaux du Pérou central :

♂. Aile 74,	queue 55–54,	culmen 9¾–10½,	tarse 16–15 mm.
♀. „ 65,	„ 53,	9,	„ 15 „

76. Calliste nigriviridis berlepschi (Tacz.).

Garita del Sol : quatre individus, juillet et août 1891.

Nos oiseaux sont un peu intermédiaires entre les spécimens de la *C. nigriviridis* typique de Bogotá et ceux de Tambillo (coll. Holzmann) qui ont servi des types à Taczanowski pour sa *C. berlepschi*.

77. Calliste cyanicollis (Lafr. et d'Orb.).

La Merced (juillet, août et septembre), Borgoña (avril 1891), Garita del Sol (juillet 1891), et Esperanza (juin 1891). "Iris brun foncé."

78. Calliste parzudakii (Lafr.).

Garita del Sol : un mâle du 2 octobre 1891. "Iris brun foncé, bec noir, pattes d'un plombé bleuâtre."

79. Calliste melanotis, Scl.

Garita del Sol : deux mâles ad., une femelle et un jeune mâle, juillet et août 1891 et avril 1893. "Iris brun foncé, bec noir, pattes d'un plombé bleuâtre."

80. Calliste xanthocephala (Tsch.).

Garita del Sol : un mâle et deux femelles, juillet et août 1891. "Iris brun foncé, bec noir, pattes d'un plombé bleuâtre."

81. Chlorochrysa calliparæa (Tsch.).

Un jeune mâle de Garita del Sol, 22 juillet 1891. "Iris brun foncé, bec noir, pattes d'un plombé bleuâtre."

Cet oiseau, comparé à des individus de la *Chl. bourcieri* (Bp.) de l'Ecuador et de la Colombie, présente les mêmes différences qu'un oiseau recueilli par Jelski. Voyez Tacz. et Berl. P. Z. S. 1885, p. 77.

82. Procnopis atrocærulea (Tsch.).

Diva atrocærulea, Tacz. Orn. Pérou, ii. p. 456.

Garita del Sol, deux mâles, 4 septembre 1891 ; Maraynioc, cinq

spécimens, août et septembre 1892 et janvier 1893. "Iris brun foncé, bec noir avec la mandibule inférieure claire, pattes d'un plombé bleuâtre."

83. Iridornis jelskii, Cab.

Maraynioc: huit exemplaires, octobre et décembre 1891, juin, juillet et août 1892, et janvier 1893. "Iris rouge très foncé, bec noir à mandibule inférieure d'un bleuâtre claire, pattes d'un noir brunâtre."

84. Iridornis analis (Tsch.).

Garita del Sol; deux paires, juillet 1891. "Iris rouge foncé, bec d'un olive bleuâtre, noir à l'arête dorsale, pattes noires."

85. Iridornis reinhardti, Scl.

Culumachay et Puyas-Yacu (Maraynioc): trois spécimens, juillet et août 1892.

86. Delothraupis castaneiventris (Scl.).

Pipridea castaneoventris, Tacz. Orn. Pérou, ii. p. 451.

Pariayacu et Culumachay (Maraynioc): sept exemplaires, août, septembre et octobre 1892. "Iris rouge, bec noir à mandibule inférieure d'un plombé bleuâtre; pattes d'un noir brunâtre."

87. Pœcilothraupis lacrymosa (Du Bus).

Maraynioc: cinq mâles et deux femelles, novembre et décembre 1891, août 1892, et janvier 1893. "Iris brun foncé, bec et pattes noirs."

88. Pœcilothraupis igniventris ignicrissa (Cab.).

P. ignicrissa, Tacz. Orn. Pérou, ii. p. 482.

Maraynioc: nombreux spécimens, juillet et septembre 1891, août, septembre et décembre 1892, et janvier 1893. "Iris chez le mâle brun foncé, chez la femelle brun clair; bec et pattes noirs."

89. Buthraupis cucullata cyanonota, subsp. nov.

B. cucullata (Jard.), Tacz. Orn. Pérou, ii. p. 483.

B. a B. cucullata (*typica*) *differt dorso, alis, caudaque extus pulchre cyaneis nec olivaceo-cærulescentibus, necnon nigredine capitis in regione nuchali et gutturali multo magis restricta.*

♂. Al. 141, caud. 93½, culm. 22¼, tars. 32¾ mm.
♀. „ 131, „ 88½, „ 21, „ 31½ „

Hab. in Peruvia centrali (Mus. Branicki et Berlepsch).

Maraynioc: cinq individus, novembre 1891, août 1892, et juin 1893. "Iris jaune rougeâtre, bec et pattes noirs."

Les individus de *Buthraupis* du Pérou central se distinguent des oiseaux typiques de Bogotá par le dos, les tectrices sous-alaires et les bordures des ailes et de la queue d'un beau bleu pur, tandis que les oiseaux typiques y présentent un bleu terne olivâtre. Les

premiers ont aussi le noir de la calotte et de la gorge en dessous beaucoup plus restreint.

Un jeune oiseau de Huasampilla, Pérou du sud (coll. Whitely) du Musée Berlepsch, a le bleu du dessus encore plus clair et plus vif et le noir de la calotte encore plus réduit, le bec plus petit que chez les oiseaux du Pérou central. Peut-être ces différences ne sont-elles pas constantes.

Les oiseaux de l'Ecuador sont intermédiaires entre la forme typique et la *B. c. cyanonota*. Ils s'accordent avec les péruviens dans la nuance du bleu des parties supérieures, mais le noir de la calotte et de la gorge est aussi étendu que chez les oiseaux de Bogotá. On pourrait en faire une troisième sous-espèce : *B. cucullata intermedia*.

90. COMPSOCOMA SUMPTUOSA (Less.).

Garita del Sol : un mâle et deux femelles, juillet, août et septembre 1891. "Iris brun rougeâtre, bec noir à mandibule inférieure d'un plombé bleuâtre ; pattes d'un plombé bleuâtre."

91. DUBUSIA STICTOCEPHALA, Berl. et Stolzm. (Plate XIII.).

Dubusia stictocephala, Berl. & Stolzm. Ibis, 1894, p. 386.

Maraynioc : trois mâles adultes et un jeune, décembre 1891, septembre 1892, et juin 1893.

Espèce nouvelle pour la faune du Pérou.

92. TANAGRA CŒLESTIS MAJOR, subsp. nov.

T. cœlestis, Tacz. Orn. Pérou, ii. p. 485.

T. *T.* cœlesti, *Spix e Fonteboa, simillima, sed differt alis caudaque longioribus, rostro quoque crassiore, necnon corpore supra subtusque viridescentiore, uropygio quoque minus albescente.*

Hab. in Peruvia centrali et septentrionali.

La Merced (juillet et septembre 1890, février 1891) et Garita del Sol (août 1891) : huit exemplaires. "Iris brun foncé."

Les oiseaux du Pérou centr. et sept. ont les ailes et la queue beaucoup plus longues que les oiseaux typiques de Fonteboa (Brésil)[1]. En outre ils ont le bec plus gros, les parties supérieures et inférieures un peu plus verdâtres, et le croupion moins blanchâtre.

Dimensions (oiseaux de La Merced) :—

♂. Aile 99–92, queue 75½–71, culmen 14½–14, tarse 19½–19 mm.
♀. „ 90, „ 67, „ 14½, „ 20 „

93. TANAGRA PALMARUM MELANOPTERA (Scl.).

La Merced : trois paires, juillet et août 1890. "Iris brun foncé."

Ces oiseaux s'accordent avec des individus de la Guyane anglaise et de Bogotá, mais l'olive des grandes tectrices alaires supérieures et du miroir paraît plus foncé et le miroir même un peu plus petit.

[1] Voir Berlepsch, Journal f. Ornith. 1889, p. 2.

94. TANAGRA DARWINI, Bp.

La Merced (août 1890), Maraynioc (novembre 1891), et Tarma (mars 1893).

Ces oiseaux ne diffèrent pas des individus du Pérou du nord et de l'Ecuador. Les oiseaux de Lima ont le bec plus gros et plus long et le jaune de la poitrine plus pâle que les individus d'autres localités, mais il paraît qu'il y a des intermédiaires.

95. TANAGRA CYANOCEPHALA (Lafr. et d'Orb.).

Garita del Sol: une paire, juillet et septembre 1891.

Nos oiseaux s'accordent mieux avec ceux de l'Ecuador occ., qu'avec les oiseaux typiques de la Bolivie. Ils se distinguent de ces derniers par la nuance des parties inférieures, qui est d'un cendré bleuâtre un peu plus foncé et par la couleur des tectrices sous-caudales, qui sont plus lavées de verdâtre.

96. RHAMPHOCELUS JACAPA CONNECTENS, subsp. nov.

Rh. atrosericeus, Tsch. Fauna Per. ii. p. 206; Tacz. Orn. Pérou, ii. p. 493.

♂ *huic* Rh. atrosericei, *Lafr. et d'Orb.*, *simillimus*, *sed differt pectore*, *abdomine*, *dorsoque minus pure nigris*, *plus minusve colore sanguineo-brunneo lavatis*.

♀ *huic* Rh. jacapæ, *L.*, *simillima*, *sed abdomine uropygioque similiter pallide rufescenti-brunneis*, *plumis dorsalibus obscure nigris apice brunneo marginatis*, *capite pallide brunneo*, *fronte*, *regione parotica*, *gulaque sanguineo lavatis*, *nec*, *sicut in femina* Rh. atrosericei, *unicolore brunneo-nigra*.

Hab. in Peruvia centrali et meridionali.

La Merced: nombreux individus, juillet, septembre et octobre 1890, et mars 1891. "Iris d'un brun café."

♂. Al. 77½, caud. 77, culm. 16, tars. 21½ mm.
♀. „ 77½, „ 78, „ 16½, 20½ „

Cette forme, dont Berlepsch possède aussi un mâle de Maranura, Pérou mérid. (coll. Whitely), paraît tout-à-fait intermédiaire entre le *Rh. jacapa* et le *Rh. atrosericeus*. Le mâle ressemble davantage à celui du dernier, mais il a le noir de la poitrine, du ventre et du dos moins pur et moins intense et un peu lavé de rouge de sang terne. Cette particularité est encore plus prononcée chez l'oiseau de Maranura, qui a presque tout l'abdomen lavé d'un rouge de sang terne.

La femelle de cette forme s'accorde tout-à-fait dans les couleurs avec celle du *Rh. jacapa*, mais elle est fort différente de celle du *Rh. atrosericeus*. Tandis que cette dernière est d'un noir mat brunâtre presque uniforme (avec seulement quelque mélange de bordures roussâtres au milieu de l'abdomen chez quelques individus), les femelles de Chanchamayo possèdent tout l'abdomen d'un roux rougeâtre, le croupion aussi fortement lavé de roussâtre, les plumes du dos noirâtres avec des bordures brunes, la tête d'un

brun pâle et terne lavée fortement de rouge de sang sur le front, les joues, la gorge, etc.

Le bec chez cette forme nouvelle paraît un peu plus long et moins courbé que chez le *Rh. atrosericeus*.

97. PYRANGA TESTACEA TSCHUDII, Berl. et Stolzm.

P. testacea tschudii, Berl. et Stolzm. P. Z. S. 1892, p. 375.

P. azaræ, Tacz. (nec d'Orb.) Orn. Pérou, ii. p. 495.

La Merced: un jeune mâle, octobre 1890.

98. PYRANGA ARDENS (Tsch.).

Garita del Sol: une paire, juillet et septembre 1891.

99. TACHYPHONUS RUFIVENTRIS (Spix).

La Gloria (août 1890 et mars 1891) et Borgoña (avril 1891). "Iris brun foncé."

100. THLYPOPSIS ORNATA MACROPTERYX, subsp. nov.

Th. ornata, Tacz. (nec Scl.) Orn. Pérou, ii. p. 507 (partim).

Th. ornatæ *ex Ecuador occ. simillima, sed major, alis caudaque imprimis longioribus, rostro crassiore, necnon capite, gula, pectore, lateribusque corporis lætius rufis distinguenda.*

Hab. in Peruvia centrali.

Marayniоc: cinq exemplaires, octobre 1891, octobre et novembre 1892. "Iris gris olivâtre, bec et pattes d'un noir brunâtre."

Dimensions comparatives :—

	Th. ornata. Bugnat (Ecuador occ.).	*Th. ornata.* Cayandeled (Ecuador occ.).			*Th. o. macropteryx.* Marayniоc. (Peruv.)		
	♂.	♂.	♀.	♀.	♂.	♀.	
Aile	57	61½	61	55	67½–71½	66	mm.
Queue	53	51½	50½	48½	56½–61	55½	„
Culmen ..	10½	10½	10	10¼	11¼–12½	11¼	„
Tarse	18½	18¾	20½	19½	20¾–21¾	21½	„

101. THLYPOPSIS AMAZONUM, Scl.

Th. amazonum, Scl. Cat. B. Brit. Mus. xi. (1886) p. 229 (descr. orig., spec. ex Amazonia sup. et Matogrosso).

La Merced: cinq spécimens, juillet et août 1890 et janvier 1891. "Iris brun foncé."

Ces oiseaux s'accordent parfaitement avec la description de Mr. Sclater. Espèce non comprise dans l' 'Ornithologie du Pérou' de Taczanowski.

102. SERICOSSYPHA ALBOCRISTATA (Lafr.).

Tendalpata, une paire, avril 1893; Tambo de Aza, trois individus, juin 1893.

103. CHLOROSPINGUS AURICULARIS (Cab.).

Marayniоc: sept exemplaires, novembre 1891, juillet, août, sep-

tembre et novembre 1892, et janvier 1893. "Iris brun foncé, bec brun à mandibule inférieure d'un plombé clair, pattes d'un plombé clair."

104. CHLOROSPINGUS CHRYSOGASTER, Tacz.

Quatre exemplaires de Maraynioc (octobre, novembre et décembre 1892). "Iris gris olivâtre, bec et pattes d'un noir brunâtre."

Cette espèce a été décrite par feu Taczanowski d'après la femelle unique envoyée par M. Jelski de Tambopata. Le mâle envoyé dernièrement par M. Kalinowski nous a permis de constater qu'il diffère très peu de la femelle, ce qui est presque général dans le genre *Chlorospingus*. Il possède les couleurs un peu plus vives; le cendré du sommet de la tête est plus pur, le jaune du dessous du corps un peu plus saturé que chez le femelle; on peut dire aussi que le bec est plus foncé—presque noir. Mais c'est par les dimensions que le mâle se distingue surtout de la femelle, comme on verra par la table suivante:—

	Aile.	Queue.	Culmen.	Tarse.
♂ ♂ (de Maraynioc) ..	85, 91½	72	12, 12½	20 mm.
♀ (de Maraynioc)	80	63	12	20 „
♂ (de Tambopata) (d'après Taczanowski)	80	64	—	20

105. CHLOROSPINGUS CINEREOCEPHALUS, Tacz.

Tambo de Aza, Maraynioc: deux femelles (novembre et décembre 1892). "Iris blanc sale, bec noir, pattes plombées."

106. CHLOROSPINGUS LEUCOGASTER (Tacz.).

Culumachay et Pariayacu (Maraynioc): sept exemplaires (juillet, août, septembre et décembre 1892).

107. PSEUDOSPINGUS[1] XANTHOPHTHALMUS (Tacz.).

Maraynioc: cinq exemplaires, novembre 1891, juin, août et octobre 1893, et mars 1893. "Iris d'un jaune pâle, bec et pattes noirs."

Le mâle de cette intéressante forme n'était pas connu jusqu'à présent. M. Kalinowski nous a fourni dans son dernier envoi deux mâles, qui nous permettent d'en donner la description. Par leur coloration ils sont identiques à la femelle; il n'y a de différ-

[1] *Pseudospingus*, gen. nov. *Tanagridarum*, generi *Chlorospingo* affinis, sed rostro graciliore, potius dacnidiformi caudaque alis multo longiore, necnon coloribus distinguendum. Species:—

1. *Ps. verticalis* (Lafr.) = *Chlorospingus verticalis* (Lafr.).
2. *Ps. xanthophthalmus* (Tacz.).

Les espèces de ce genre diffèrent des espèces du genre *Chlorospingus* par le bec plus mince rappellant plutôt celui du genre *Dacnis*, par la queue très longue, plus longue que l'aile, et par le plumage soyeux et un peu luisant.

Suivant l'observation de Stolzmann, les mœurs du *Ps. xanthophthalmus* diffèrent également de celles des espèces du genre *Chlorospingus* qu'il a eu l'occasion d'observer au Pérou du nord.

ence que dans les dimensions, qui sont plus fortes chez les mâles que chez les femelles, ce qui ressort de la table suivante :—

♂. Aile 73, queue 75, culmen 13, tarse 20 mm.
♀. „ 64, „ 72, „ 11, „ 20 „

La seule différence que Stolzmann a trouvé entre les exemplaires de Maraynioc et la femelle de Tamiapampa, Pérou du nord (coll. Stolzmann), est que celle-ci a la ligne dorsale du bec un peu courbée en bas, tandis qu'elle est presque droite dans les spécimens du Pérou central.

108. PIPILOPSIS TRICOLOR (Tacz.).

Carenochrous tricolor, Tacz. Orn. du Pérou, i. p. 525.

Garita del Sol : un mâle adulte et une femelle jeune, août 1891. "Iris brun clair, bec noir, pattes brunes."

109. PIPILOPSIS MYSTACALIS (Tacz.).

Carenochrous taczanowskii, Scl. et Salv., Tacz. Orn. Pérou, ii. p. 526.

Maraynioc : six exemplaires, novembre 1891, juillet et août 1892, et janvier, février et juillet 1893. "Iris rouge, bec et pattes noirs."

110. BUARREMON BRUNNEINUCHUS (Lafr.).

Garita del Sol : une femelle, 17 juillet 1891.

111. BUARREMON POLIOPHRYS, sp. n.

B. torquatus, Tacz. (nec Lafr. et d'Orb.) Orn. Pérou, ii. p. 530 (Maraynioc).

B. B. torquato, *Lafr. et d'Orb., simillimus, differt superciliis supra- et postocularibus griseis, tæniæ verticali concoloribus, nec albis, stria tenuissima solummodo partem anteriorem supercilii usque ad oculum superne cingente alba* (*fere ut in* B. assimili).

Long. tot. 176, al. 80½, caud. 84½, culm. 15¾, tars. 29½ mm.

Hab. in Peruvia centrali (Mus. Branicki et Varsov.).

Maraynioc : deux femelles, novembre 1892 et avril 1893.

Cette espèce nouvelle se distingue aisément du *B. torquatus*, Lafr. et d'Orb., de la Bolivie, dont Berlepsch a comparé trois individus boliviens, par la strie surcilière d'un gris ardoisé semblable à celui du vertex au lieu d'être d'un blanc pur. Il n'y a qu'une bordure étroite blanchâtre au-dessus de la partie antérieure de la strie surcilière, qui s'arrête au-dessus de l'œil. Par cette particularité l'espèce nouvelle s'accorde avec le *B. assimilis*, Boiss., mais elle possède la bande noire au haut de la poitrine comme chez le *B. torquatus*, bande qui manque complètement au *B. assimilis*. Il s'accorde aussi avec la *B. torquatus* dans tous les autres détails de la coloration et dans les dimensions.

La description donnée par M. Taczanowski des individus recueillis par M. Jelski à Maraynioc sous le nom de *B. torquatus* s'applique très bien aux oiseaux de Kalinowski.

112. CISSOPIS LEVERIANA MINOR (Tsch.).

C. minor, Tacz. Orn. Pérou, ii. p. 536.

La Merced (juillet et octobre 1890, mars 1891), Garita del Sol (septembre 1891). "Iris jaune."

Un mâle examiné par Berlepsch a le bec plus long et plus attenué vers le bout qu'un oiseau de Bogotá. Le noir du dos et de la poitrine est plus étendu en bas et d'un éclat plus verdâtre au lieu de bleuâtre. Les rectrices externes moins largement terminées de blanc.

113. PSITTOSPIZA ELEGANS (Tsch.).

Maraynioc : nombreux exemplaires, novembre et décembre 1891, juillet, août et octobre 1892, et avril 1893.

Un mâle de Tamiapampa (Pérou sept.), comparé par Stolzmann avec les oiseaux du Pérou central, présente les dimensions plus fortes et le roux-cannelle du visage et du crissum plus clair.

114. SALTATOR SUPERCILIARIS, Spix.

S. azaræ, Tacz. Orn. Pérou, ii. p. 540.

S. cærulescens, Tacz. Orn. Pérou, ii. p. 544 (partim).

La Merced : plusieurs oiseaux, juillet et août 1890 et janvier et février 1891. "Iris brun clair."

Un mâle examiné par Berlepsch s'accorde en général avec les oiseaux d'Iquitos (Amazone sup.) et ne s'en distingue que par les ailes et la queue un peu plus longues et par la couleur de la poitrine et du haut du ventre un peu plus blanchâtre ou moins mélangée de gris roussâtre.

115. SALTATOR MAGNUS (Gm.).

La Gloria (août 1890) et La Merced (avril 1891) : deux femelles. "Iris brun."

116. SALTATOR ALBOCILIARIS (Phil. et Landb.).

Pitylus albociliaris, Phil. et Landb., Wiegm. Arch. 1863, p. 122; Tacz. Orn. Pérou, ii. p. 549.

Saltator laticlavius, Scl. P. Z. S. 1869, p. 151; Tacz. Orn. Pérou, ii. p. 545.

Acobamba (juillet 1890), Garita del Sol (juillet 1891) et Maraynioc (novembre 1891 et août 1892). "Iris brun, bec jaune sale, pattes noirâtres."

Il n'y a pas de doute que le *Saltator laticlavius*, Scl., ne soit synonyme du *Pitylus albociliaris*, Phil. et Landb. Comme le dernier nom est plus ancien, il doit être accepté pour cette espèce.

117. SCHISTOCHLAMYS ATRA (Gm.).

Orchesticus ater, Tacz. Orn. Pérou, ii. p. 547.

Le Merced : trois spécimens, juillet et août 1890. "Iris brun grisâtre."

Fam. Fringillidæ.

118. Phructicus chrysogaster (Less.), subsp.

Plusieurs individus de Huamani (décembre 1889), de Garita del Sol (juillet 1891) et de Maraynioc (août 1892 et juin 1893). "Iris brun foncé."

Ces oiseaux appartiennent à la forme à gros bec (*cf.* Berl. et Tacz. P. Z. S. 1884, p. 292) qu'on pourrait peut-être distinguer comme race locale du *Ph. chrysogaster* typique (habitant la région littorale de l'Ecuador et du Pérou).

119. Volatinia jacarina splendens (Vieill.).

Trois exemplaires de La Merced (juillet 1890, février et mars 1891).

Un oiseau examiné par Berlepsch a les tectrices sous-alaires entièrement noires, et par conséquent appartient à la forme *splendens*. Il ne diffère d'un mâle de la Guyane anglaise que par la queue un peu plus courte.

N.B.—La *Volatinia* de Lima nommé par nous *V. jacarini* devrait peut-être constituer une race distincte; car, selon les observations de Jelski et d'autres voyageurs, le mâle ne prend jamais une livrée tout-à-fait noire. Il paraît que les mâles de Lima ont les rémiges et les tectrices supérieures toujours bordées d'un brun grisâtre. Les tectrices sous-alaires sont en partie blanches comme dans la *V. jacarini* typique.

120. Sporophila castaneiventris, Cab.

Spermophila castaneiventris, Tacz. Orn. Pérou, iii. p. 2.

La Merced: quatre mâles, juillet et décembre 1890 et janvier et mars 1891. "Iris brun rougeâtre, bec et pattes noirs."

Les oiseaux du Pérou (Iquitos, La Merced et Cosnipata) examinés par Berlepsch présentent des dimensions un peu plus fortes que les spécimens typiques de la Guyane anglaise. Ils se distinguent notamment par le bec plus fort.

121. Sporophila luctuosa, Lafr.

Spermophila luctuosa, Tacz. Orn. Pérou, iii. p. 10.

La Gloria et La Merced (juillet et août 1890, décembre 1890, février et mars 1891): plusieurs exemplaires. "Iris brun foncé."

122. Catamenia inornata minor, Berl.

C. inornata minor, Berl. P. Z. S. 1885, p. 115.

C. rufirostris (Landb.), Tacz. Orn. Pérou, iii. p. 21.

Maraynioc: quelques exemplaires, décembre 1891, août 1892 et juin 1893.

Les oiseaux du Pérou central présentent des dimensions un peu plus fortes que ceux de l'Ecuador, mais les individus écuadoriens comparés par nous se trouvent en plumage usé.

♂ ad. Aile 69, queue 60½, culm. 9¾ tarse 21½ mm.
♀ ♀. „ 65½–70½, „ 57½–63, „ 9¼–9½, „ 21½ „

123. CATAMENIA HOMOCHROA, Scl.

Maraynioc: trois mâles adultes et un jeune, décembre 1891 et novembre 1892. "Iris brun foncé, bec d'un blanchâtre carné, pattes brunes."

Cet oiseau (le mâle) s'accorde avec un mâle adulte de l'Ecuador du Musée Berlepsch.

124. CATAMBLYRHYNCHUS DIADEMA CITRINIFRONS, subsp. nov.

C. diadema, Tacz. Orn. Pérou, iii. p. 24.

C. C. diademati, *Lafr.*, *simillimus, sed fronte pallidiore fere citrino- nec aurantio-flavo, corpore subtus lateribusque capitis clare rufo-brunneis nec intense castaneis distinguendus.*

♂. Al. 69½, caud. 73½, culm. 9½, tarse 22½ mm.
♀. „ 66½, „ 71¾, „ 11⅛, „ 21½ „

Hab. in Peruvia centrali (Mus. Branicki et Berlepsch).

Maraynioc: cinq individus, décembre 1891, septembre 1892 et janvier 1893.

Les individus de *Catamblyrhynchus* de Pérou central se distinguent au premier coup d'œil des oiseaux de Bogotá et de l'Ecuador par le jaune du front beaucoup plus pâle, presque citron, au lieu d'un jaune d'or orangé. Les parties supérieures et les côtés de la tête sont d'un roux brun clair au lieu d'un brun châtain obscur. Il n'y a pas d'autres caractères distinctifs.

125. SPODIORNIS JARDINEI, Scl.

Spodiornis jelskii, Tacz. Orn. Pérou, iii. p. 42; Sharpe, Cat. B. Brit. M. xii. p. 798.

Garita del Sol: une paire, février et mars 1893. "Iris brun foncé; bec chez le mâle noir, chez la femelle noir à mandibule inférieure d'un plombé bleuâtre foncé; pattes chez le mâle noires brunâtres, chez la femelle carnées."

Ces oiseaux nous permettent de déclarer l'identité de la *S. jelskii* avec la *S. jardinei*. On sait que la description de Taczanowski du *S. jelskii* était basée sur la femelle unique de Ropaybamba. Nos oiseaux viennent d'une localité très voisine de Ropaybamba, et pourtant ils ne diffèrent presque point des oiseaux écuadoriens (*S. jardinei*). Il faudra donc supprimer l'espèce de Taczanowski.

126. PHRYGILUS CHLORONOTUS, sp. nov.

Ph. gayi, Tacz. (nec Eyd. & Gerv.) Orn. Pérou, iii. p. 32.

? *Ph. punensis*, Sharpe (nec Ridgway), Cat. B. Brit. Mus. xii. p. 785 (Tinta).

Ph. Ph. punensi, *Ridgw.*, *affinis, sed dorso pure flavescenti-olivaceo (nec brunneo) pectore abdomineque flavescentiore (minus brunneo lavato), capite gulaque pallidius schistaceis, necnon rostro longiore et crassiore (in hoc genere maximo) distinguendus.*

♂. Al. 95½, caud. 68½, culm. 17¾–18, tars. 26½ mm.
♀. „ 94½, „ 67, „ 17½, „ 25¾ „

Ingapirca: trois individus, juin 1890; Tarma: six oiseaux, octobre 1892, août et septembre 1893. "Iris brun foncé, bec noir corné à mandibule inférieure et à bord de la mâchoire près de la base d'un plombé bleuâtre, pattes d'un carné brunâtre."

Il paraît que les oiseaux de Tinta décrits par le Dr. Sharpe sous le nom de *Ph. punensis* appartiennent à la même forme que celui du Pérou central, car il dit que le dos est "rich olive-yellow" tandis que Ridgway, dans sa description du *Ph. punensis*, basée sur des échantillons du Lac Titicaca, a remarqué que le dos est plus brunâtre (ou "rufescent") que chez le *Ph. gayi*. C'est pourquoi nous présumons que le *Ph. saturatus*, Sharpe, est le même que le *Ph. punensis*, Ridgway.

127. PHRYGILUS UNICOLOR (Lafr. et d'Orb.).

"*Ph. rusticus*, Tsch.," Tacz. Orn. Pérou, iii. p. 38.

Ingapirca (juin 1890), Maraynioc (novembre 1892 et février 1893). "Iris brun foncé."

128. PHRYGILUS PLEBEIUS, Tsch.

Ingapirca (mai et juin 1890), Maraynioc (novembre 1892): huit individus. "Iris brun foncé."

129. PHRYGILUS FRUTICETI (Kittl.).

Une femelle le Chicla (27 avril 1890) et deux mâles de Tarma (décembre 1891 et octobre 1893). "Iris brun foncé."

130. PHRYGILUS ALAUDINUS (Kittl.).

Tarma (1 septembre 1893) et Jauja (19 juillet 1893): deux mâles jeunes.

131. DIUCA SPECULIFERA (Lafr. et d'Orb.).

Une femelle de Baños (29 avril 1890). "Iris brun."

Cet oiseau ne diffère des échantillons de la Bolivie que par le bec un peu plus long et plus épais.

132. PSEUDOCHLORIS SHARPEI, Berl. et Stolzm.

Ps. sharpei, Berl. et Stolzm. Ibis, 1894, p. 386.

Sycalis uropygialis, Tacz. (nec Lafr.) Orn. Pérou, iii. p. 58.

Nombreux individus d'Ingapirca (mai et juin 1890) et de Tarma (juillet et septembre 1893). "Iris brun clair, bec noir à mandibule inférieure d'un plombé bleuâtre avec la pointe noirâtre, pattes d'un carné brunâtre."

133. PSEUDOCHLORIS LUTEA (Lafr. et d'Orb.).

Sycalis lutea, Tacz. Orn. Pérou, iii. p. 56.

Sycalis chloris, Tschudi, Faun. Peruan., Orn. p. 216.

Tarma (octobre 1892 et août 1893) et Jauja (juillet 1893): six individus. "Iris brun foncé, bec d'un gris brunâtre à mandibule inférieure plus claire, pattes d'un carné brunâtre."

Al. 82–81½, caud. 59–56, culm. 11¾–10¾, tars. 19½–18½ mm.

Ces oiseaux s'accordent parfaitement avec des spécimens recueillis par Garlepp dans la Bolivie occidentale.

134. SPINUS ICTERICUS PERUANUS, subsp. nov.

Chrysomitris capitalis, Tacz. (nec Cab.) Orn. Pérou, iii. p. 49; Berl. et Stolzm. P. Z. S. 1892, p. 377 (Lima et Ica).

Intermedia quasi inter S. ictericum *et* S. capitalem.

♂ *huic* S. icterici *simillimus, sed rostro paullo breviore, colore corporis flavo paullo obscuriore, uropygioque minus flavo perfuso, necnon remigibus tertiariis griseo-albo nec flavo marginatis, a mari* S. capitalis *coloribus vividioribus, colli lateribus distincte flavis (nec dorso concoloribus), dorso flavidiore viridi, uropygio magis flavo perfuso, pectore abdomineque purius flavis, necnon colore rectricum basali flavo magis extenso distinguendus.*

♀ *a femina* S. icterici *simillima, rostro breviore distinguenda.*

Hab. in Peruvia centrali orientali (circum La Merced et Garita del Sol) et in occidentali (circum Lima et Ica).

	Long. alæ.	Caudæ.	Culm.	Tarsi.
♂ ♂	71 –66½,	45 –42,	10–9½,	14½–13½ mm.
♀ ♀	65½–65,	41½–40,	10–9½,	15½–14 „

Nombreux individus de La Merced (janvier) et de Garita del Sol (juillet 1891).

Nous avons déjà montré (*l. c.*) quelques différences entre les oiseaux de Lima et Ica et ceux de l'Ecuador (*capitalis*, Cab.). Les oiseaux de La Merced et de Garita del Sol s'accordent avec les spécimens de Lima et d'Ica. Ils n'en diffèrent qu'en ce que le miroir alaire paraît toujours moins étendu. Dans ce dernier caractère ils s'accordent mieux avec les oiseaux de l'Ecuador.

L'examen d'une belle série d'oiseaux péruviens et écuadoriens nous a convaincu qu'il y a des races locales constantes, qu'il faudra séparer. La race péruvienne paraît plus proche du *S. ictericus* (Licht.) du Brésil, dont elle ne diffère que par le bec généralement plus court, par le jaune d'or des parties inférieures un peu plus terne, par le croupion moins lavé de jaune d'or et par les bordures des rémiges tertiaires, qui sont généralement d'un blanc grisâtre au lieu d'un jaune verdâtre.

Du *S. capitalis* de l'Ecuador la race péruvienne diffère par la couleur des côtés du cou, qui est d'un jaune semblable à celui des parties inférieures au lieu d'être verte semblable à celle du dos. Le jaune des parties inférieures est plus clair, moins verdâtre, le croupion plus lavé de jaune, tandis qu'il est presque semblable au dos chez le *S. capitalis*; le dos aussi d'un vert plus jaunâtre. Le jaune de la base des rectrices externes plus étendu, de sorte que le tiers noirâtre de ces pennes est plus court que chez le *S. capitalis*.

La femelle de la forme péruvienne, quant à sa coloration, ne paraît pas différente des femelles des deux races voisines, mais on pourrait la distinguer de la femelle du *S. ictericus* par son bec un peu plus court.

135. SPINUS OLIVACEUS, Berl. et Stolzm.

Spinus olivaceus, Berl. et Stolzm. Ibis, 1894, p. 387.

Garita del Sol: trois mâles adultes et une femelle, 24 juillet 1892 et 13 février 1894.

136. SPINUS SCLATERI (Sharpe)?

Une femelle de Garita del Sol, 27 juillet 1891.

Cet oiseau diffère des femelles du *S. ictericus peruanus* par la couleur des parties inférieures, qui est blanche grisâtre mêlée un peu de jaune olivâtre.

Il s'accorde en général avec la description de la femelle du *S. sclateri*, Sharpe (Cat. B. xii. p. 200), et avec une femelle de Mapoto (Ecuador or.)—nommée *capitalis* par Taczanowski, P. Z. S. 1885, p. 85—et ne diffère que par les parties supérieures plus lavées de grisâtre. On ne peut résoudre la question avant d'avoir examiné le mâle provenant de la même localité.

137. SPINUS ATRATUS (Lafr. et d'Orb.).

Chrysomitris atrata, Tacz. Orn. Pérou, iii. p. 53.

Ingapirca (juin 1890), Maraynioc (février 1893), Jauja (juillet 1893) et Tarma (juillet 1893): six spécimens. "Iris brun foncé."

Un mâle examiné par Berlepsch a les ailes et la queue plus courtes que les oiseaux typiques de La Paz, Bolivie.

138. AMMODROMUS PERUANUS (Bp.).

Coturniculus peruanus, Tacz. Orn. Pérou, iii. p. 43.

La Merced: quatre spécimens, juillet 1890. "Iris brun foncé."

Fam. ICTERIDÆ.

139. OSTINOPS ALFREDI (Des Murs).

Trois mâles et une femelle de La Merced (juillet 1890 et avril 1891) et de Borgaño (mai 1891). "Iris gris bleuâtre, bec blanc jaunâtre."

140. OSTINOPS ATROVIRENS (Lafr. et d'Orb.).

Deux mâles de La Gloria (9 août 1890) et de Garita del Sol (juin 1891). "Iris cendré bleuâtre ou brun, bec d'un jaune olivâtre pâle, pattes noires."

141. OSTINOPS DECUMANUS (Pall.).

La Merced (19 juillet 1890): une femelle. "Iris bleu de ciel."

142. CASSICUS ALBIROSTRIS (L.)[1].

Tanagra albirostris, Linn. Mus. Ad. Frid. ii. prodr. (1764) p. 31 (typ. ex America, Mus. Ad. Frid.).

[1] Les règles américaines d'après lesquelles on commence la nomenclature zoologique à partir de l'an 1758 nous permettent de changer le nom impropre de "*persicus*" en "*albirostris*," le dernier nom étant imposé par Linné à la même espèce deux ans plus tôt. Le *Cassicus albirostris*, Vieill., devra donc porter le nom de *C. chrysopterus* (Vig.).—BERL. et STOLZM.

Oriolus persicus, Linn. Syst. Nat. ed. xii. (1766) p. 161.
Cassicus persicus, auct., Tacz. Orn. Pérou, ii. p. 411.

La Merced (juillet et août 1890): six oiseaux. "Iris bleu de ciel, bec jaune bleuâtre pâle."

143. CASSICUS LEUCORHAMPHUS (Bp.).

Chilpes (juillet 1891), Marayniоc (juillet et septembre 1892 et 1893): cinq oiseaux.

144. AMBLYCERCUS SOLITARIUS (Vieill.).

Cassicus solitarius, Tacz. Orn. Pérou, ii. p. 415.

Une femelle de La Merced (24 août 1890). "Iris rouge sale, bec d'un jaune olivâtre pâle, pattes noires."

145. ICTERUS CAYANENSIS (Linn.).

Un mâle de La Merced (23 juillet 1890). "Iris brun."
Al. 99½, caud. 98½, culm. 22, tars. 23½ mm.
L'oiseau envoyé se distingue d'un individu du Musée Berlepsch, qui provenait probablement de Cayenne, par le jaune des épaules beaucoup plus pâle, presque citron au lieu d'orangé brunâtre, par les tibias mélangés un peu de jaune et par le bec beaucoup plus long et distinctement courbé.

146. DOLICHONYX ORYZIVORUS (Linn.).

Un mâle non complètement adulte et un jeune oiseau en plumage de transition. La Merced (1891—mars).

Fam. CORVIDÆ.

147. XANTHOURA YNCAS (Bodd.).

Cyanocorax yncas, Tacz. Orn. Pérou, ii. p. 396.

Un mâle et quatre femelles de Garita del Sol (juillet, août et septembre 1891).

148. XANTHOURA JOLYÆA (Bp.).

Deux paires de Tambo de Aza (Marayniоc), septembre 1892 et février 1893. "Iris noirâtre, bec et pattes noires."

Ces oiseaux ne diffèrent d'un mâle adulte de Tamiapampa, Pérou du nord (coll. Stolzmann), appartenant au Musée Berlepsch, que par le dos et la poitrine plus lavés d'un bleu violâtre ou pourpre.

Fam. TYRANNIDÆ.

149. AGRIORNIS INSOLENS, Scl. et Salv.

? *Agriornis solitaria*, Tacz. (nec Scl.) Orn. Pérou, ii. p. 183.
Agriornis insolens, id. ibid. ii. p. 183.

Ingapirca (mai et juin 1890), Tarma (juillet 1892) et Marayniоc août 1892 et février 1893): sept spécimens. "Iris blanc sale, bec et pattes noirs."

♂. Al. 137½, caud. 104, culm. 24¾, tars. 34½ mm.
♀. „ 132, „ 101½, „ 24½, „ 33½ „

150. MYIOTHERETES ERYTHROPYGIUS, Scl.

Pariayacu (Maraynioc), août 1892 : une paire. "Iris brun foncé, bec et pattes noirs."

♂. Al. 139½, caud. 105½, culm. 18, tars. 31½ mm.
♀. „ 135½, „ 99, „ 17¼, „ 30 „

Ces oiseaux ne diffèrent des oiseaux de l'Ecuador, d'où venait le type, que par les ailes et la queue un peu plus courtes et par le dos plus noirâtre, moins brunâtre.

151. MYIOTHERETES STRIATICOLLIS (Scl.).

Garita del Sol (13 août 1891) et Pariayacu (juillet et août 1892) : trois mâles.

152. OCHTHODIÆTA FUMIGATUS (Boiss.).

Un mâle de Culumachay (Maraynioc), 21 juillet 1892. "Iris brun café, bec et pattes noirs."

Al. 113, caud. 91½, culm. 21, tars. 24½ mm.

Les oiseaux du Pérou central s'accordent avec les échantillons de Bogotá et de l'Ecuador, et ne diffèrent que par les rectrices externes à bordures externes plus pâles ou plus blanchâtres et par les bordures des tectrices sus-alaires plus obscures et moins roussâtres.

153. OCHTHOËCA ŒNANTHOÏDES BRUNNEIFRONS, subsp. nov.

Ochthoëca fumicolor, Tacz. (nec Scl.), Orn. Pérou, ii. p. 191.
Ochthoëca œnanthoïdes (pt.), Scl. Cat. B. Brit. Mus. xiv. (1888) p. 20 (Ecuador et Pérou centr.).

O. O. œnanthoïdi *simillima, sed paulo major, pileo anteriore brunneo, dorso fere concolore (nec olivaceo-griseo lavato), gula fuscescentiore, necnon stria superciliari post oculum distincte rufescente (nec sordide flavescenti-alba) distinguenda.*

Hab. in Peruvia centrali et septentrionali et in Ecuadoria.

	Long. alæ.	Caudæ.	Culm.	Tarsi.
♀ (Maraynioc—Peruvia centr.).	86½	76½	—	24 mm.
♀ (Cutervo—Peruvia centr.) .	81	71½	14	22½ „
Oiseaux de l'Ecuador	94–85½	81½–74	15–13½	24–23½ „

Maraynioc (octobre et décembre 1891, août et septembre 1892) : cinq oiseaux. "Iris brun foncé, bec et pattes noirs."

Mr. Sclater a déjà démontré que les oiseaux de l'Ecuador ne peuvent pas être réunis avec l'*O. fumicolor*, Scl., de Bogotá, qui est plus pâle en dessous avec la gorge blanchâtre, la poitrine d'un brun grisâtre fauve, le ventre d'un brun roussâtre pâle, et les sous-caudales d'un blanc sale.

La forme qui habite l'Ecuador et le Pérou du nord et central à presque la même coloration des parties inférieures que l'*O. œnanthoïdes*, Lafr. et d'Orb., de la Bolivie et du Pérou méridional (Cachupata). Elle diffère néanmoins de l'*O. œnanthoïdes* par la

couleur du piléum antérieur, qui est presque la même que celui du dos au lieu d'olive grisâtre comme chez l'*O. œnanthoïdes*. La différence la plus tranchante consiste dans la coloration de la strie surcilière, qui chez l'*O. œnanthoïdes* est d'un blanc jaunâtre sale uniforme, tandis qu'elle est fortement lavée de roussâtre dans la partie postoculaire chez la forme que nous venons de décrire. Celle-ci a aussi les dimensions généralement plus fortes. Par la coloration du dessus du corps la forme nouvelle ressemble plutôt à l'*O. fumicolor* qu'à l'*O. œnanthoïdes*.

154. Ochthoëca polionota, Scl. et Salv.

Une paire d'Ingapirca (juin 1890) et un mâle de Queta près de Tarma (29 juillet 1893). "Iris brun foncé."

Al. 92, caud. 80, culm. 13½, tars. 23½ mm.

Nous n'avons pas eu l'occasion de comparer des oiseaux typiques de Pitumarca, Pérou du sud, mais il faut remarquer que nos oiseaux ont le dos d'un brun terreux, tandis que nous lisons dans la diagnose de MM. Sclater et Salvin "*supra cinerea*."

155. Ochthoëca leucometopa, Scl. et Salv.

Acobamba (11 juillet 1890) et Tarma (décembre 1890, juillet et août 1893): quatres exemplaires. "Iris brun foncé."

Ces oiseaux s'accordent avec un spécimen typique de Paucartambo (Pérou du Sud) du Musée Berlepsch.

156. Ochthoëca jelskii spodionota, subsp. nov.

O. O. jelskii (*ex Peruv. septentr. occ.*) *simillima, sed differt dorso obscure olivaceo-brunneo* (*nec castaneo-brunneo*), *fronte etiam aureo-flavo multo latiore et lætiore ut videtur.*

Hab. in Peruvia centrali (typus in Mus. Branicki).

♂ ♂. Al. 69–66½, caud. 60½–57½, culm. 11¼–10¾, tars. 21½ mm.

Un mâle adulte du 22 juin 1892 de Maraynioc, Pariayacu, et un jeune mâle du 17 septembre 1892 de Maraynioc, Culumachay. "Iris brun, bec et pattes noirs."

C'est par méprise que Mr. Sclater, dans le Cat. Brit. Mus. xiv. p. 22, réuni l'*O. jelskii*, Tacz., avec l'*O. pulchella*, Scl., de la Bolivie, car la dernière n'a pas de jaune au front.

Les oiseaux du Pérou central paraissent également différents de l'*O. jelskii*, Tacz. (dont le type venait de la Montaña de Nancho au nord-ouest du Pérou), ayant le dos d'un brun d'olive à peine roussâtre (encore plus obscur que chez l'*O. citrinifrons* de l'Ecuador, tandis que l'*O. jelskii* est dit être parfaitement distincte de l'*O. citrinifrons* par le dos plus roux. Les oiseaux de Maraynioc diffèrent aussi de l'*O. citrinifrons* par le jaune du front beaucoup plus large et plus intense (plutôt d'un jaune d'or que d'un jaune citron pâle), dont Taczanowski ne fait pas mention dans la description de l'*O. jelskii*. En outre les oiseaux de Maraynioc diffèrent de l'*O. citrinifrons* par le cendré de la gorge et de la poitrine un peu plus obscur, par les sous-caudales blanches, par des bordures d'un brun roussâtre des tectrices alaires et des rémiges tertiaires, enfin par

les dimensions plus grandes. Par ces derniers caractères elle paraît s'accorder avec l'*O. jelskii*.

157. Ochthoëca lessoni, Scl.

Maraynioc (octobre 1891, juillet, août et septembre 1892): cinq oiseaux.

Al. 67½, caud. 61, culm. 11¾, tars. 19¾ mm.

158. Ochthoëca thoracica, Tacz.

Une paire de Maraynioc (juillet et août 1892).

L'oiseau typique du Musée Universitaire de Varsovie venait de Chilpes—localité très voisine de Maraynioc.

♂. Al. 68½, caud. 64 , culm. 12¾, tars. 19¾ mm.
♀. „ 65½, „ 52½, „ 11½, „ 18½ „

159. Ochthoëca rufimarginata, Lawr.

Maraynioc (novembre 1891, août et septembre 1892): trois exemplaires.

160. Sayornis cinerascea angustirostris, subsp. nov.

Sayornis cinerascea, Tacz. Orn. Pérou, ii. p. 204.

S. S. cinerascæ (*Lafr.*) *e Venezuela simillima, differt rostro multo angustiore et breviore, capite, dorso, gula, pectore ventrisque lateribus intensius nigris* (*nec nigro-brunneis*), *uropygio quoque obscurius schistaceo, tectricibus subcaudalibus nigro-brunneis sordide albo marginatis* (*nec majore ex parte albescentibus*).

Hab. in Peruvia centrali (et in Ecuadoria ?).

♂. Long alæ 94½, caud. 84, culm. 15, tars. 18 mm.

Deux mâles et une femelle de La Merced (juillet 1890, janvier et mars 1891).

La *Sayornis* du Pérou central se distingue des oiseaux de Caracas (*S. cinerascea* typique) par le bec beaucoup plus étroit et plus court, par la couleur noirâtre du corps plus intense (moins brunâtre), et par les tectrices sous-caudales d'un noir brun et bordées d'un gris blanchâtre au lieu d'être presque blanches en entier comme c'est le cas chez les oiseaux du Vénézuela.

Un oiseau de l'Ecuador du Musée Berlepsch a le bec petit comme le spécimen de La Merced et paraît appartenir à la même forme. Les individus de la Bolivie du Musée Berlepsch (*S. latirostris*, Cab. et Heine) ont le bec large comme la *S. cinerascea* typique et ne s'en distinguent que par les tectrices sous-caudales noirâtres et les tectrices sus-alaires et les tertiaires plus largement bordées de blanc. Un oiseau de Bogotá (Musée Berlepsch) ne paraît pas différent des oiseaux de la Bolivie.

161. Copurus colonus fuscicapillus (Scl.).

Copurus colonus (Vieill.), Tacz. Orn. Pérou, ii. p. 209.

Dix individus, dont quatre mâles, une femelle et deux jeunes oiseaux (en plumage complètement noir) de La Merced, de La Gloria

(juillet et août 1890, janvier et avril 1891) et de Garita del Sol (juillet 1891). "Iris brun foncé."

Les oiseaux de Bogotá (*C. fuscicapillus* typique), de l'Ecuador, du Pérou et de la Bolivie ont toujours les deux rectrices médianes beaucoup plus longues que ceux du Brésil. La *Muscicapa colonus*, Vieill., repose sur la forme du Paraguay, qu'il faudra examiner.

La femelle de La Merced se distingue des mâles adultes par le piléum plus brunâtre dans sa partie postérieure et par le ventre mélangé de blanchâtre.

162. MUSCISAXICOLA ALBIFRONS (Tsch.).

Deux mâles. Cordillères du Pérou central (avril 1890). "Iris brun clair."

163. MUSCISAXICOLA CINEREA, Phil. et Landb.

Ingapirca (juin 1890): deux mâles. "Iris brun."
Al. 112½, caud. 77½–76½, culm. 14½, tars. 28½ mm.

164. MUSCISAXICOLA FLAVINUCHA, Lafr.

Ingapirca (juin 1890): six individus. "Iris brun."

165. MUSCISAXICOLA RUBRICAPILLA, Phil. et Landb.

Un mâle de Maraynioc, 23 juillet 1892. M. Kalinowski avait envoyé cet individu sous le nom de *M. juninensis*, mais cette dernière est une espèce tout-à-fait distincte.

166. MUSCISAXICOLA JUNINENSIS, Tacz.

Ingapirca (mai et juin 1890), Pariayacu et Tarma (juillet et septembre 1892, juillet 1893). "Iris brun foncé."

167. MUSCISAXICOLA RUFIVERTEX, Lafr. et d'Orb.

Chicla (avril 1890), hacienda de Queta près de Tarma (juillet et septembre 1893). "Iris brun clair."

Ces oiseaux s'accordent tout-à-fait avec les échantillons recueillis par Garlepp à La Paz, Bolivie.

168. MUSCISAXICOLA MACULIROSTRIS, Lafr. et d'Orb.

Ingapirca (mai 1890), Queta (juillet 1893) et Maraynioc (septembre 1892). "Iris brun foncé."

♂ ad. Al. 86½, caud. 63½, culm. 13½, tars. 25 mm.

Le type de la *M. maculirostris* venait de La Paz, Bolivie, et ayant comparé une belle série d'oiseaux recueillis par Garlepp à Chicani, dans la Bolivie occidentale, Berlepsch a pu constater que les oiseaux du Pérou central n'en diffèrent par aucun détail.

Une femelle de Yocon, Ecuador occ. (coll. Stolzmann), du Musée Branicki, comparée à l'oiseau de Junin (Ingapirca) présente des différences considérables. Cet oiseau a le bec plus court et plus large à la base, et les ailes et la queue plus courtes. Les parties inférieures sont fortement lavées et mélangées de roussâtre, tandis que chez l'oiseau de Junin elles sont d'un blanc sale lavées un peu

de brun grisâtre sur la poitrine et d'un rosé tendre sur l'abdomen. Les tectrices sous-alaires et les bords internes des rémiges sont d'un ochreux vif au lieu d'un blanc roussâtre.

Pour cette forme de l'Ecuador occ. nous proposons le nom de *M. maculirostris rufescens*, Berl. et Stolzm.

♀ de Yocon. Long. al. 80½, caud. 62½, culm. 12, tars. 25½ mm.

169. Muscisaxicola fluviatilis, Scl. et Salv.

Trois femelles de La Merced (juillet, août et septembre 1890). "Iris brun foncé."

Nous n'avons pas pu comparer nos oiseaux avec les exemplaires typiques de l'Ucayali. Ils s'accordent parfaitement avec un oiseau recueilli par Garlepp à Juntas, Bolivie. Il paraît que les oiseaux typiques de l'Ucayali auraient les bandes alaires plus marquées.

170. Muscisaxicola rufipennis, Tacz.

Un jeune oiseau de Maraynioc, Pariayacu, de 15 août 1892.

Al. 128¾, caud. 94, culm. 20½, tars. 29½ mm.

Cette espèce nous paraît plutôt une *Tæniopteru*, ayant le bec plus large que les espèces de *Muscisaxicola*. Peut-être faudra-t-il en former un genre nouveau.

171. Centrites oreas, Scl. et Salv.

Nombreux individus d'Ingapirca (mai et juin 1890). "Iris brun foncé." Le type venait de Tinta, Pérou du sud.

172. Platyrhynchus flavigularis, Scl. et Salv.

Un oiseau en mue, sans indication du sexe, de La Gloria (6 février 1891). "Iris brun clair."

Espèce nouvelle pour la faune péruvienne.

L'oiseau envoyé par Kalinowski s'accorde bien avec les individus typiques de Bogotá.

Il faut cependant remarquer que le pileum paraît un peu plus lavé de brun roussâtre, et que la gorge est d'un jaune plus ochreux ou plus saturé. Les dimensions sont peut-être un peu plus fortes : aile 64, queue 33½, culmen 11, tarse 13½ mm.

173. Todirostrum cinereum (L.).

La Merced (juillet et septembre 1890, février et avril 1891), La Gloria (août 1890) et San Emilio (mai 1893). "Iris jaune pâle."

Ces oiseaux ont les ailes un peu plus longues, et la queue beaucoup plus longue, qu'un oiseau de Cayenne. Toutes les parties supérieures sont plus noirâtres, surtout le noir du piléum plus intense et plus prolongé vers la nuque. Le type du *T. cinereum* venait de Surinam. Les oiseaux de Bogotá paraissent intermédiaires.

Les deux œufs recueillis par M. Kalinowski à Chanchamayo sont d'une forme ovale typique, arrondis au gros bout et graduellement attenués vers le petit bout. La coque, d'un blanc pur, est assez lisse, mais sans lustre. Dimensions : 16½ × 12, 16 × 11½ mm.

174. EUSCARTHMUS PYRRHOPS, Cab.

Une femelle de Culumachay (Maraynioc), 17 septembre 1892. Al. 44½, caud. 41½, culm. 10½, tars. 15½ mm.

Les oiseaux typiques du Musée Universitaire de Varsovie venaient de Maraynioc et de Tambopata.

175. EUSCARTHMUS LATIROSTRIS, Pelz.

La Merced : un mâle du 27 juillet 1890. "Iris brun foncé."

Cet individu diffère un peu des oiseaux typiques par les couleurs en général plus intenses et par les tibias roux au lieu de verdâtres. Ces différences pourraient être individuelles, car l'oiseau a le plumage très frais.

Cette espèce était omise dans l' 'Ornithologie du Pérou' de Taczanowski, quoiqu'elle était trouvé par Hauxwell à Chamicuros et par Bartlett à Nauta (Pérou or.).

176. EUSCARTHMUS MARGARITACEIVENTER (Lafr. et d'Orb.), subsp.?

Euscarthmus wuchereri, Tacz. (nec Scl. et Salv.) Orn. Pérou, ii. p. 233.

Deux paires de La Merced (juillet 1890; janvier, février et avril 1891). "Iris jaune orangé chez les deux mâles et chez une femelle, jaune pâle chez l'autre; bec brun à mandibule inférieure carnée à la base, pattes d'un carné rosé."

Ces oiseaux diffèrent un peu des exemplaires typiques envoyés par Garlepp de la Bolivie (Musée Berlepsch). Ils ont le milieu de l'abdomen un peu lavé de jaunâtre, tandis que chez l'*E. margaritaceiventer* typique il est d'un blanc pur. En outre ils ont le dos d'un vert olive plus clair, et cet olive est plus étendu vers la nuque, tandis que chez les oiseaux boliviens le cendré noirâtre du piléum se prolonge presque jusqu'au dos supérieur. Enfin les individus de La Merced ont le bec un peu plus long et la mâchoire d'un brun rougeâtre au lieu de noirâtre. Les ailes et la queue sont généralement un peu plus courtes. En cas que ces différences seraient constantes, il faudrait peut-être nommer les oiseaux péruviens *Euscarthmus margaritaceiventer rufipes* (Tsch.), car l'*E. rufipes* de Tschudi paraît s'appliquer à cette forme. L'*E. pelzelni*, Scl. et Salv., de Matogrosso, est peut-être peu distinct des oiseaux du Pérou.

177. CÆNOTRICCUS RUFICEPS (Lafr.).

Serphophaga ruficeps, Tacz. (nec Lafr.), Orn. Pérou, ii. p. 237.

Un mâle adulte de Sarnapaycha (Maraynioc), 22 février 1893. "Iris brun rougeâtre, bec noir à mandibule inférieure jaune, pattes d'un gris olivâtre."

L'oiseau envoyé a des dimensions plus fortes que trois individus de Bogotá examinés par Berlepsch. L'aile est un peu, la queue considérablement plus longue, le bec plus étroit que chez les oiseaux auxquels ils ont été comparés.

Les tectrices sus-alaires sont d'un brun olivâtre presque uniforme, au lieu d'être bordées d'un roux châtain vif comme chez les oiseaux de Bogotá. Les rémiges et les rectrices sont bordées d'un brun olive roussâtre au lieu d'un brun châtain. Enfin le roux de la tête est plus terne, le vert olive du dos plus lavé de brunâtre, et le milieu de l'abdomen d'un jaune verdâtre au lieu d'un jaune soufré pur. La mandibule inférieure est d'un jaune plus clair sans mélange brunâtre.

Il paraît donc que l'oiseau du Pérou mérite d'être séparé, mais avant de le décrire comme sous-espèce nouvelle il faudra examiner plusieurs échantillons de cette région. En attendant nous lui réservons le nom provisoire *C. ruficeps haplopteryx*, Berl. et Stolzm.

♂. Maraynioc .... Al. 62½, caud. 49½. culm. 10½, tars. 23½ mm.
Specimina de Bogotá. „ 60½, „ 46½, „ 10½, „ 22½ „

178. LOPHOTRICCUS SQUAMICRISTATUS (Lafr.).

Garita del Sol: une femelle du 1 juillet 1891.

179. ORCHILUS ALBIVENTRIS, Berl. et Stolzm.

Orchilus albiventris, Berl. et Stolzm. Ibis, 1894, p. 389.

Mâle unique de La Merced (10 septembre 1890).

180. HAPALOCERCUS ACUTIPENNIS, Scl. et Salv.

La Merced: un jeune mâle du 20 juillet 1890. "Iris brun foncé."
♂ juv. Al. 48, caud. 49, culm. 10¼, tars. 18½ mm.

181. SERPHOPHAGA CINEREA, Strickl.

La Merced: deux femelles du 25 février 1891 et du 25 août 1890.

Ces oiseaux s'accordent tout-à-fait avec des individus de l'Ecuador, de la Bolivie etc. Les oiseaux de Lima ne diffèrent que par le dos un peu plus obscur.

182. ANÆRETES PARULUS ÆQUATORIALIS, Tacz. et Berl.

Anæretes parulus, Tacz. Orn. Pérou, ii. p. 239.

Acobamba (juillet 1890), Tarma (décembre 1890) et Maraynioc (octobre 1891 et août 1892). "Iris brun foncé."

Ces oiseaux s'accordent avec les spécimens de l'Ecuador et du Pérou du Nord, séparés par Taczanowski et Berlepsch sous la dénomination d'*A. parulus æquatorialis* (P. Z. S. 1884, p. 296).

183. CYANOTIS RUBRIGASTRA ALTICOLA, subsp. nov.

Cyanotis azaræ[1], Tacz. Orn. Pérou, ii. p. 243 (partim).

C. C. rubrigastræ (Vieill.) ex Argentina, Chilia et Brasilia simillima, differt alis caudaque longioribus et nigredine in parte basali

[1] Le nom le plus ancien pour cette espèce est *Sylvia rubrigastra* (Vieill.) (typus ex Paraguay).

vexilli interni rectricum externarum magis extensa, dimidium basale fere occupante.

♂. Long. tot. 136–128, alæ 57, caudæ 49½, culminis 9¾, tarsi 19 mm.
♀. „ 128, „ 55–54½, „ 48, „ 9½, „ 19½ „

Dimensions de la *C. rubrigastra* typique :—

	Aile. mm.	Queue. mm.	Culm. mm.	Tars. mm.
♀. Chonchitas, Argentina, 25 oct., Mus. Scl.	47½	42	10½	19½
♂. La Plata, „ 10 nov., „	51¾	45½	11¼	19¾
♂. „ „ 6 nov., „	50	43	10½	19½
♂. „ „ 4 nov., „	52	46½	—	19¾
Ad. Chili, Musée Berlepsch	48½	42½	9½	18
„ Lima (Nation), Mus. Scl.	50	38½	11¼	19¼

Hab. in Peruvia centrali alta.

Huit individus d'Ingapirca (24 à 26 mai 1890). "Iris brun bleuâtre; envergure du mâle 177–174, de la femelle 173-168 mm."

Comparés aux oiseaux de la rép. Argentine, du Chili et du Brésil méridional, nos exemplaires d'Ingapirca (Junin) présentent une différence considérable dans la longueur des ailes et de la queue, qui sont beaucoup plus longues que chez les oiseaux typiques. En outre le noir sur la partie basale de la barbe interne des rectrices externes est considérablement plus étendu, occupant presque la moitié de la longueur, tandis que chez les oiseaux d'autres contrées on ne voit qu'une petite tache à l'extrême base de cette barbe. Les rémiges, surtout les secondaires, sont plus distinctement bordées de blanc à la pointe. Il paraît aussi que le rouge de la huppe interne et le jaune des sourcils et du dessous du corps sont un peu plus clairs. Le bec paraît aussi plus mince.

C'est un fait remarquable qu'un individu de Lima du Musée Sclater recueilli par le Prof. Nation appartient à la vraie *C. rubrigastra*. Il paraît donc que la forme que nous venons de décrire serait propre aux régions très élevées du Pérou.

184. Mecocerculus stictopterus tæniopterus (Cab.).

Mecocerculus stictopterus, Tacz. Orn. Pérou, ii. p. 201.

Marayniоc (novembre 1891, juillet et septembre 1892): trois mâles et une femelle.

Les oiseaux du Pérou se distinguent des oiseaux de l'Ecuador et de la Colombie par le dos d'un olive verdâtre au lieu d'un olive brunâtre (*cf.* Tacz. *l. c.*).

185. Pogonotriccus ophthalmicus, Tacz.

La Gloria: une femelle du 21 février 1891.

186. Mionectes striaticollis (Lafr. et D'Orb.).

Une femelle de Garita del Sol (septembre 1891), un jeune mâle de La Gloria (février 1891), et un mâle adulte de Puyas-Yacu (15 juillet 1892).

Les oiseaux du Pérou, de l'Ecuador et de la Colombie paraissent différents des oiseaux typiques de la Bolivie par le plombé de la

tête et de la gorge plus restreint, moins pur et plus mêlangé de verdâtre, par les stries de la poitrine plus étroites et plus jaunâtres (au lieu de blanchâtres) sur un fond olivâtre moins foncé, enfin par les tectrices sus-alaires grandes et moyennes bordées à la pointe d'un roussâtre pâle produisant une sorte de bandes alaires dont l'oiseau bolivien ne présente aucune trace. En cas que ces différences seraient constantes, on pourrait distinguer la forme septentrionale comme *M. striaticollis poliocephalus* (Tsch.).

187. LEPTOPOGON AMAUROCEPHALUS PERUVIANUS (Scl. et Salv.).

Leptopogon peruvianus, Tacz. Orn. Pérou, ii. p. 248.

Un mâle de La Merced (26 août 1890). "Iris brun bleuâtre."

Dimensions: Aile 66, queue 56½, culmen 13, tarse 14¾ mm.

Cet oiseau a les dimensions un peu plus fortes qu'un mâle de Samiria (Amazone sup.—coll. Hauxwell) du Musée Berlepsch.

188. LEPTOPOGON SUPERCILIARIS, Tsch.

La Merced: un mâle du 16 septembre 1890. "Iris brun clair."

189. LEPTOPOGON RUFIPECTUS, Tacz.

Un mâle de Marayniocc du 24 octobre 1892. "Iris brun foncé, bec noir, pattes d'un gris bleuâtre."

Al. 69½, caud. 64, culm. 11½, tars. 14½ mm.

C'est une espèce tout-à-fait distincte, peut-être plus voisine du *L. erythrops*, Scl., que de toute autre.

190. PHYLLOMYIAS SEMIFUSCA WAGÆ (Tacz.).

Myiopatis wagæ, Tacz. Orn. Pérou, ii. p. 253.

Deux mâles et une femelle de La Merced (septembre 1890, février et mars 1891). "Iris brun foncé."

Aile 59¾, queue 57, culmen 9½, tarse 18½ mm.

Ces oiseaux paraissent un peu intermédiaires entre la *Ph. wagæ* du Pérou du nord et la forme de Bahia, qui doit probablement porter le nom de *Ph. semifusca superciliaris* (Reinh.). Ils ne se distinguent des spécimens de Bahia que par le dos plus lavé de grisâtre et d'olivâtre au lieu de roussâtre.

191. TYRANNISCUS FRONTALIS, Berl. et Stolzm. (Plate XIV.)

Tyranniscus frontalis, Berl. et Stolzm. Ibis, 1894, p. 390.

Garita del Sol (juillet, août et septembre 1891) et San Emilio (Vitoc) (mai 1893): trois mâles et une femelle.

192. TYRANNISCUS PLUMBEICEPS (Lawr.).

Pogonotriccus plumbeiceps, Lawr.; Scl. Cat. B. Brit. Mus. xiv. p. 99.

Deux femelles: La Gloria (24 janvier 1891) et Garita del Sol (8 novembre 1892). "Iris brun, bec noir, pattes plombées."

Aile 59–58½, queue 59–53½, culmen 8½–7¾, tarse 15 mm.

Elles s'accordent avec les oiseaux de l'Ecuador oriental recueillis par Stolzmann.

193. ELAINEA PALLATANGÆ, Scl.

Une femelle de Pariayacu, Maraynioc (1 août 1892).
Al. 74⅜, caud. 69½, culm. 9⅜, tars. 16½ mm.

194. ELAINEA ALBICEPS (Lafr. et d'Orb.).

Un mâle adulte de Garita del Sol (14 juillet 1891).
Aile 77½, queue 67, culmen 8¼, tarse 17½, "long. totale 166, envergure 254" mm.

Avant d'avoir examiné les types de l'*E. albiceps*, Lafr. et d'Orb., et de l'*E. modesta*, Tsch., il est impossible de dire avec certitude à quelles formes ces dénominations s'appliqueront en réalité. Quant à *M. albiceps*, Lafr. et d'Orb., il nous paraît que les individus de Tacna (qui sont peut-être identiques à ceux de Lima) et non ceux de Rio Janeiro (qui appartenaient ou à l'*E. albiceps parvirostris*, Pelz., ou à l'*E. pagana*) ont servi de types à la description.

Il se peut aussi que les oiseaux de Yungas aient servi de types. Dans la description de la *M. modesta*, Tschudi fait mention de larges pointes blanches aux tectrices sus-alaires, ce qui s'appliquerait mieux aux oiseaux de l'orient qu'a ceux de l'occident, mais les mesures données par Tschudi s'accordent bien avec celles des oiseaux occidentaux.

En tout cas il faudra séparer les oiseaux de l'orient de ceux de l'occident du Pérou. L'oiseau de Garita del Sol se distingue de ceux de Lima et d'Ica par les dimensions beaucoup plus petites, le bec beaucoup plus étroit et plus faible, et par les bandes alaires formées par les bordures terminales des tectrices les plus longues et des médiaires plus larges et plus blanchâtres, enfin par les plumes de la huppe plus allongées et plus terminées en pointe.

L'oiseau de Garita ressemble plus à l'oiseau de Chili qu'à celui de Lima, mais celui de Chili a le bec également plus large et diffère par la couleur des parties supérieures du corps un peu plus pâle et plus uniforme et non variée par des disques plus foncés au milieu des plumes; la gorge et la poitrine sont plus grisâtres, moins blanchâtres; enfin les ailes sont un peu plus longues. Un mâle de Fuerte d'Andalgala, Catamarca (coll. White), du Musée Berlepsch, s'accorde le mieux avec l'oiseau de Garita, mais diffère néanmoins par les ailes plus longues et le bec plus long et moins comprimé.

195. ELAINEA GIGAS, Scl. et Salv.

La Merced: une femelle (29 août 1890). "Iris brun."
Aile 88½, queue 74½, tarse 18½ mm.
Cet oiseau s'accorde bien avec les individus de Huayabamba (Pérou du nord et de Bogotá) du Musée Berlepsch.

196. ELAINEA OBSCURA, Lafr. et d'Orb.

Garita del Sol (juillet et août 1891): deux mâles.
Ces oiseaux s'accordent avec des spécimens recueillis par Garlepp dans la Bolivie occidentale.

197. SUBLEGATUS BREVIROSTRIS (Tsch.).

Elainea brevirostris, Tsch. Arch. x. 1 (1844), p. 274; id. Faun. Per., Aves, p. 272; Tacz. Orn. Pérou, ii. p. 272.

Empidagra brevirostris, Cab.; Scl. Cat. B. Brit. Mus. xiv. p. 155.

Le Merced: une femelle du 29 août 1890. "Iris brun foncé."

Long. totale 153, envergure 226, aile 69, queue 66, culmen 8, tarse 16¾ mm.

Cette espèce est assez proche du *S. platyrhynchus* (Scl. et Salv.) du Brésil. Elle ne diffère que par les ailes et la queue plus longues et les couleurs plus vives. On peut supposer que le *S. griseocularis*, Scl. et Salv., est identique à l'espèce de Tschudi, dont MM. Cabanis et Sclater ont malheureusement fait une *Empidagra*.

198. LEGATUS ALBICOLLIS (Vieill.).

La Merced: un mâle, octobre 1890. "Iris brun foncé."

Al. 81½, caud. 61, culm. 13½, tars. 15¾ mm.

199. MYIOZETETES SIMILIS (Spix).

La Merced: cinq individus, juillet 1890. "Iris brun olivâtre."

Ces oiseaux ont le dos un peu plus verdâtre, et les rémiges moins bordées de roussâtre, que les oiseaux de Bahia. Ils sont presque intermédiaires entre le *M. similis* du Brésil et le *M. texensis colombianus* (Cab. et Heine) de Bogotá, mais ressemblent plus au premier.

200. RHYNCHOCYCLUS VIRIDICEPS, Scl. et Salv.

Rhynchocyclus viridiceps, Scl. et Salv. P. Z. S. 1873, p. 280 (*typus e Pebas*).

La Merced: deux mâles (27 juillet et 12 septembre 1890). "Iris brun foncé."

Ces oiseaux s'accordent en général avec la description du *Rh. viridiceps*, dont le type, jusqu'à présent unique, venait de Pebas, Haut-Amazone. Ils diffèrent cependant par les dimensions plus fortes et par le manque de la strie surcilière d'un jaune orangé, qui se trouve chez le type de Pebas examiné par Berlepsch il y a quelques années.

	Aile.	Queue.	Culmen.	Tarse.	
♂ ♂ de la Merced..	63½–60½	53½–49½	12½–11¾	17½–16¾	mm.
♂ de Pebas	57	44	11½	16½	„

201. MYIODYNASTES SOLITARIUS (Vieill.).

La Gloria (août 1890), La Merced (septembre 1890 et mars 1891), Borgoña (avril 1891), et Garita del Sol (octobre 1891). "Iris brun foncé."

Ces oiseaux s'accordent bien avec les oiseaux typiques de Paraguay du Musée Berlepsch.

202. MYIODYNASTES CHRYSOCEPHALUS (Tsch.).

Garita del Sol: une femelle du 14 février 1893.
Al. 105½, caud. 89, culm. 23¾, tars. 17½ mm.

203. HIRUNDINEA SCLATERI, Reinh.

Deux individus: ♂ de Chanchamayo (7 février 1891), et ♀ de Garita del Sol (28 août 1891).

204. MYIOBIUS NÆVIUS (Bodd.)?

La Merced: un jeune mâle du 20 juillet 1890. "Iris brun foncé."
Aile 59, queue 55, culmen 10¾, tarse 14¾ mm.
Cet oiseau s'accorde bien avec des femelles ou jeunes mâles de Bahia. Il a la huppe interne rousse. Il faudra voir le mâle adulte à huppe jaune.

205. MYIOBIUS CINNAMOMEUS (Lafr. et d'Orb.).

Garita del Sol: deux femelles, juin et septembre 1891. S'accordent avec les oiseaux typiques de la Bolivie.

206. MYIOBIUS FULVIGULARIS, Salv. et Godm.

Myiobius fulvigularis, Salv. et Godm. Biolog. Centr.-Amer., Aves (1889), p. 58 (typus ex Am. centr.).
Myiobius erythrurus, Tacz. (nec Cab.) Orn. du Pérou, ii. p. 301.
Borgoña: une femelle du 21 avril 1891.

207. PYROCEPHALUS RUBINEUS (Bodd.).

La Merced: un jeune mâle, août 1890. "Iris brun foncé."

208. EMPIDOCHANES PŒCILURUS PERUANUS, subsp. nov.

Empidochanes pœcilurus, Tacz. Orn. Pérou, ii. p. 314.

E. E. pœciluro ex Bogota affinis, differt rectricibus duabus externis—macula anteapicali fusca excepta—fere omnino pallide rufis, cæteris—duabus intermediis omnino fuscis exceptis—pogonio externo solummodo fuscis, interno omnino rufis, necnon abdomine ochraceo saturatiore, rostro etiam longiore.

♀ de Garita: al. 70¼, caud. 62, culm. 11¼, tars. 17½ mm.

Hab. in Peruvia septentr. (Tambillo), centrali (Garita del Sol), et in meridionali (Cosnipata). Garita del Sol: une femelle du 23 juillet 1891.

La femelle envoyée par Kalinowski, de même qu'une jeune femelle de Tambillo du Musée Berlepsch (recueillie par Stolzmann), se distingue d'un oiseau de Bogotá par la coloration de la rectrice externe. L'oiseau de Bogotá la présente en grande partie noirâtre avec les deux tiers de la barbe interne brun roussâtre, tandis que chez les oiseaux du Pérou cette rectrice est d'un roux pâle presque uniforme à l'exception d'une petite tache noirâtre dans la portion terminale. Les rectrices suivantes chez les oiseaux du Pérou ont la barbe externe noirâtre, l'interne d'un roux brun uniforme, tandis

que chez l'oiseau de Bogotá la barbe interne est en grande partie noirâtre. Enfin les oiseaux du Pérou présentent l'abdomen d'un ochreux plus intense et ont le bec plus long. Mr. Sclater (Cat. Birds Brit. Mus. xiv. p. 218) avait déjà mentionné la différence entre les oiseaux du Pérou et de la Colombie.

209. MITREPHANES OCHRACEIVENTRIS (Cab.).

Mitrephorus ochraceiventris, Tacz. Orn. Pérou, ii. p. 315.

Maraynioc: deux mâles adultes, dont un du 17 novembre 1891 et l'autre du 1 décembre 1892. "Iris brun foncé, bec et pattes noirs."

210. MITREPHANES OLIVACEUS, Berl. et Stolzm.

Mitrephanes olivaceus, Berl. et Stolzm. Ibis, 1894, p. 391.

Mâle unique de Garita del Sol (3 septembre 1891).

211. CONTOPUS ARDESIACUS (Lafr.).

Chanchamayo (juillet 1890) et Garita del Sol (septembre 1891): une paire de jeunes oiseaux. "Iris brun foncé."

212. CONTOPUS VIRENS RICHARDSONI (Swains.)?

La Merced, un mâle adulte du 27 février 1891, et La Gloria, une femelle plus jeune du 19 février 1891.

♂. Aile 88, queue 68, culmen 14, tarse 13¾ mm.
♀. „ 81½, „ 62½, „ 13¼, „ 11½ „

213. MYIARCHUS CEPHALOTES, Tacz.

La Merced (décembre 1890) et Garita del Sol (juillet 1891 et avril 1893): cinq oiseaux.

214. MYIARCHUS TRICOLOR, Pelz.

Myiarchus nigriceps, Tacz. (nec Scl.) Orn. Pérou, ii. p. 324 (partim).

Une paire de Borgoña (27 avril 1891) et de La Gloria (17 janvier 1891).

Ces oiseaux s'accordent en général avec un spécimen de Bahia, Brésil, du Musée Berlepsch (*M. tricolor* typique) et diffèrent du *M. nigriceps*, Scl., de l'Ecuador occidental et de Tambillo, Pérou du nord, ayant le piléum d'un brun noirâtre au lieu d'un noir intense. Ils ressemblent le plus aux oiseaux de l'Ecuador oriental, de Bogotá et de Bucaramanga du Musée Berlepsch.

215. TYRANNUS MELANCHOLICUS (Vieill.).

La Merced: cinq oiseaux du juillet 1890. "Iris brun clair."

Fam. PIPRIDÆ.

216. PIPRITES TSCHUDII, Cab.

La Gloria (janvier et février) et La Merced (mars 1891): deux mâles et une femelle.

Ces oiseaux s'accordent avec les individus de l'Ecuador or. et de Bogotá du Musée Berlepsch. Il paraît néanmoins qu'ils diffèrent constamment en ayant les tectrices sus-alaires bordées à la pointe d'un blanc olivâtre au lieu de vert, ce qui forme une seconde raie sur l'aile, tandis que les oiseaux des autres localités n'en ont qu'une.

217. CHLOROPIPO UNICOLOR, Tacz.

Garita del Sol: une femelle du 8 juillet 1891. "Iris brun foncé, bec brun à mandibule inférieure d'un brun bleuâtre, pattes d'un brun bleuâtre." Envergure 252, long. lat. 143, aile 75½, queue 50½, culmen 14½, tarse 11½ mm.

Mr. Sclater dans le Cat. B. Brit. Mus. xiv. p. 286 a placé le *Ch. unicolor*, Tacz., comme synonyme du *Ch. uniformis* (avec point d'interrogation), mais l'espèce de Taczanowski est tout-à-fait distincte. Berlepsch a comparé la femelle de Garita del Sol avec un mâle et deux femelles du *Ch. uniformis* de la Guyane anglaise et a trouvé qu'elle en diffère par le bec totalement différent, beaucoup plus comprimé et plus droit à l'arête dorsale de la mâchoire très saillante et non arrondie comme chez le *Ch. uniformis*, par la mandibule inférieure en partie blanchâtre, par le vert du plumage beaucoup plus foncé, le piléum d'un vert noirâtre un peu luisant. La différence la plus frappante consiste dans la couleur et dans la forme des tectrices sous-alaires postérieures, qui chez le *Ch. unicolor* sont allongées, soyeuses et lisses et d'une couleur blanc de neige, tandis que chez le *Ch. uniformis* elles sont de la forme ordinaire et d'une couleur blanchâtre lavée de jaune verdâtre. Il y a aussi chez le *Ch. unicolor* un fascicule de longues plumes soyeuses aux côtés du corps sous l'aile d'un blanc de neige qui manquent au *Ch. uniformis*. Du reste le *Ch. unicolor* est plus petit dans toutes ses dimensions.

218. PIPRA CHLOROMEROS, Tsch.

La Gloria (août 1890, janvier et février 1891), La Merced (septembre 1890 et mars 1891) et Borgoña (juin 1891). "Iris blanc jaunâtre."

219. PIPRA COMATA, Berl. et Stolzm.

Pipra comata, Berl. et Stolzm. Ibis, 1894, p. 392.

La Gloria (août 1890) et Garita del Sol (juin et août 1891, avril 1893).

220. PIPRA CÆRULEOCAPILLA, Tsch.

La Gloria et La Merced: cinq oiseaux, août 1893 et février 1891. "Iris brun foncé."

221. HETEROPELMA AMAZONUM, Scl.

La Gloria: un mâle du 11 août 1890. "Iris brun clair."

Envergure 299, long. totale 185, aile 89, queue 70½, culmen 12¾, tarse 20½ mm.

L'oiseau envoyé par Kalinowski diffère un peu d'un spécimen du

H. amazonum, Scl., de l'Ecuador oriental du Musée Berlepsch. Dans la couleur des parties inférieures il n'y a pas de différences, mais les parties supérieures sont plus verdâtres, presque comme chez le *H. wallacei*, à l'exception du piléum, qui est presque aussi roussâtre que chez le *H. turdinum*. Les ailes sont courtes, comme chez le *H. wallacei*, la queue plus longue que chez le *H. wallacei* et le *H. amazonum*, mais plus courte que chez le *H. turdinum*. Le bec est mince, comme chez le *H. amazonum*.

Il faudrait voir plusieurs individus avant de décrire la forme péruvienne comme espèce ou sous-espèce nouvelle.

Fam. Cotingidæ.

222. Tityra semifasciata fortis, subsp. nov.

Tityra semifasciata, Tacz. Orn. du Pérou, ii. p. 353.

T. T. semifasciatæ *simillima, sed alis caudaque longioribus, necnon pictura rectricum externarum maris distinguenda.*

Hab. in Peruvia centrali et in Bolivia.

La Gloria (août 1890) et La Merced (janvier 1891). "Iris chez le mâle rouge-brique sale, la base du bec et le tour de l'œil d'un rouge sale; chez la femelle l'iris est rosâtre sale."

♂. Aile 131, queue 80½, culmen 28½, tarse 24½ mm.
♀. „ 131, „ 80½, „ 29¾, „ 25 „

Les oiseaux du Pérou central et de la Bolivie (♀ du Mus. Berl.) comparés à un mâle de Tocantins (*T. semifasciata* typique) et un ♂ d'Iquitos du Musée Berlepsch ont les ailes et la queue constamment plus longues et le mâle diffère encore par le blanc plus étendu sur la barbe interne des deux paires des rectrices externes. Chez la *T. semifasciata* typique ces rectrices présentent une large bande noire occupant les deux barbes sans interruption, tandis que chez le mâle de la *T. semifasciata fortis* il n'a qu'une petite tache sur la barbe interne qui n'atteint pas le rachis. Il paraît aussi que chez nos oiseaux le blanc du corps est plus lavé de grisâtre.

223. Pachyrhamphus niger (Spix).

Un mâle adulte et un jeune mâle. La Merced (août 1890). "Iris brun foncé."

Le jeune mâle a les parties inférieures plus claires et ressemble beaucoup à des individus du *P. polychropterus* (Vieill.), mais il possède déjà quelques plumes noirâtres à la gorge, prouvant qu'il porte le plumage de transition.

224. Pachyrhamphus versicolor (Hartl.).

Un jeune mâle de Vitoc, Huacras, du 22 janvier 1893. Iris brun noirâtre.

Al. 65½, caud. 52½, culm. 11½, tars. 16½ mm.

225. Rupicola peruviana (Lath.).

La Gloria (juillet 1890 et janvier 1891), Garita del Sol (juillet

1891) et San Emilio (1892): huit mâles et deux jeunes. "Iris blanc avec un anneau autour de la pupille jaunâtre, bec et pattes d'un jaune citron."

226. PIPREOLA VIRIDIS INTERMEDIA, Tacz.

Un mâle de Chilpes (30 juillet 1891) et une paire de Culumachay (juillet et septembre 1892). "Iris d'un olive bleuâtre, bec d'un rouge corail, pattes de la même couleur mais plus claires."

227. PIPREOLA ELEGANS (Tsch.).

Deux mâles et une femelle de Garita del Sol (juillet, août et septembre 1891). "Iris jaune olivâtre, bec d'un rouge orangé, pattes d'un brun olivâtre; chez la femelle le bec est d'un rouge orangé sale."

228. PIPREOLA FRONTALIS, Scl.

Un mâle adulte, Garita del Sol (16 août 1891). "Iris jaune olivâtre, bec orangé, pattes de la même couleur, mais plus claires." Espèce nouvelle pour la faune péruvienne.

229. AMPELIO ARCUATUS (Lafr.).

Maraynioc: quatre mâles et deux femelles, novembre 1891, août, septembre et novembre 1892, et mars 1893.

230. HELIOCHERA RUBROCRISTATA (Lafr. et d'Orb.).

Maraynioc: trois mâles, deux femelles et un jeune oiseau, novembre 1891, juin, juillet et septembre 1892.

231. HELIOCHERA RUFAXILLA (Tsch.).

Une femelle de Garita del Sol du 12 mars 1893.

232. CEPHALOPTERUS ORNATUS, Geoffr.

Chanchamayo (juillet 1890) et Borgoña (mai 1891). "Iris blanc."

Fam. DENDROCOLAPTIDÆ.

233. GEOSITTA CUNICULARIA JUNINENSIS, Tacz.

Quatre oiseaux de Baños (avril) et d'Ingapirca (juin 1890). "Iris brun foncé." Comparés avec les oiseaux typiques du Musée Universitaire de Varsovie. Il est très probable que la *G. cunicularia juninensis*, Tacz., sera identique avec la *G. frobeni*, Phil. et Landb., mais avant de la réunir à cette espèce il serait recommandable d'examiner le type de la *G. frobeni* de Putre, Pérou, qui est dit avoir la moitié basale de la queue blanche au lieu de roussâtre.

234. GEOSITTA SAXICOLINA, Tacz.

Ingapirca (mai 1890) et Macabamba près de Tarma (juillet 1893). "Iris brun." S'accordent avec les oiseaux typiques du Musée Universitaire de Varsovie.

235. Geositta tenuirostris (Lafr. et d'Orb.).

Ingapirca (mai et juin 1890), environs de Tarma (décembre 1892 et juillet 1893).

Ces oiseaux paraissent être identiques à un mâle de Vacas, Bolivie ; peut-être ont-ils les ailes un peu plus courtes, le dos un peu plus foncé, et la barbe externe des rectrices externes plus blanchâtre.

236. Upucerthia jelskii (Cab.).

Sept oiseaux d'Ingapirca (mai 1890) et un mâle de l'hacienda de Queta (8 juillet 1893). "Iris brun foncé."

Comparés aux oiseaux typiques du Musée Universitaire de Varsovie.

237. Upucerthia serrana, Tacz.

Deux mâles de Palcamayo (juillet 1890) et quatre exemplaires de l'hacienda de Queta (décembre 1892, juillet et septembre 1893). "Iris brun foncé."

S'accordent avec les types du Musée Universitaire de Varsovie.

Mr. Sclater a placé l'*U. serrana*, Tacz., comme synonyme de l'*U. andecola*, Lafr. et d'Orb., mais selon nous elle est bien distincte. Il nous paraît que l'*U. bridgesi*, Scl., est identique à l'*U. andecola*.

238. Cinclodes rivularis, Cab.

Cinq oiseaux d'Ingapirca (mai et juin 1890) et un mâle de Canchacso (17 mai 1893). "Iris brun foncé."

Comparés aux oiseaux typiques du Musée Universitaire de Varsovie.

Espèce bien distincte du *Cinclodes fuscus* (Vieill.).

239. Cinclodes bifasciatus, Scl.

Acobamba (août 1890) et hacienda de Queta (décembre 1892) : deux mâles. "Iris brun foncé."

Al. 112, caud. 83½, culm. 21¾, tars. 31½ mm.

240. Schizœaca palpebralis, Cab.

Synallaxis palpebralis, Tacz. Orn. du Pérou, ii. p. 130.

Maraynioc (novembre et décembre 1891, août 1892) : trois mâles adultes et un jeune. "Iris brun clair, bec noir à mandibule inférieure d'un plombé bleuâtre, pattes d'un plombé bleuâtre."

Al. 61, caud. 124–113½, culm. 13¼–13, tars. 24½–24 mm.

241. Phlœocryptes melanops (Vieill.).

Trois mâles d'Ingapirca (mai 1890). "Iris brun foncé."

Al. 61½, caud. 57½, culm. 16½, tars. 21½ mm.

Il n'y a pas de différence entre ces oiseaux et d'autres de Rio Grande do Sul, Brésil du sud.

242. SYNALLAXIS ELEGANTIOR, Scl.

Synallaxis frontalis, Tacz. (nec Pelz.) Orn. Pérou, ii. p. 122.

Une paire de Garita del Sol (juin et juillet 1891). "Iris brun rougeâtre, bec brun à mandibule inférieure d'un plombé bleuâtre à la base, pattes d'un plombé olivâtre."

Ces individus diffèrent des oiseaux typiques de la *S. elegantior*, Scl., de l'Ecuador par l'abdomen presque uniformement gris, au lieu de blanchâtre au milieu, et par le haut de la gorge plus noirâtre.

243. SYNALLAXIS BRUNNEICAUDA CABANISI (Berl. et Lev.).

Synallaxis cabanisi, Berl. et Lev. Ornis, 1890, p. 21.
Synallaxis brunneicauda, Tacz. Orn. Pérou, ii. p. 124.

Un mâle de La Merced (septembre 1890). "Iris rouge-brique sale."

244. SYNALLAXIS GULARIS RUFIVENTRIS, subsp. nov.

Synallaxis gularis (pt.), Scl. P. Z. S. 1859, p. 192 (Ecuador); id. P. Z. S. 1860, p. 89 (Nanegal, Ecuador); id. P. Z. S. 1894, p. 16, pt. (specimina ex Ecuador); id. Cat. B. Brit. Mus. xv. p. 55, pt.

S. S. gulari (*Lafr.*) *e Colombia simillima, differt corpore inferiore collique lateribus saturate cinnamomeo-rufis* (*nec griseo-fuscis*), *albedine gulæ magis restricta et inferius minus conspicue nigro marginata, corpore superiore imprimis in pileo rufescentiore, tectricibus subalaribus rufescentius tinctis. Long. tot.* 143, *al.* 60½, *caud.* 55½, *culm.* 12¾, *tars.* 20¾ *mm.*

Hab. in Peruvia centrali et in Ecuadoria or. (?).

Un mâle adulte de Maraynioc (16 novembre 1891). "Iris brun foncé, bec noir à mandibule inférieure jaunâtre à la base, pattes d'un plombé olivâtre."

Mr. Sclater a démontré (P. Z. S. 1874, p. 16) que les oiseaux de l'Ecuador oriental se distinguent des oiseaux typiques, de Bogotá, du *S. gularis* par les parties inférieures d'un brun cannelle plus pâle que le dos, tandis que les exemplaires de Bogotá l'ont plus ou moins cendré. Mr. Sclater remarque aussi que de quatre peaux de Bogotá une ressemblait aux oiseaux écuadoriens.

Notre oiseau de Maraynioc se distingue au premier coup d'œil d'une peau de la *S. gularis* de Bogotá du Musée Berlepsch par les parties inférieures et les côtés du cou d'un brun cannelle clair très vif au lieu d'un olive grisâtre lavé de roussâtre; par le blanc de la gorge beaucoup plus restreint (au menton) et moins bordé de noirâtre en dessous, par les parties supérieures d'un brun roussâtre un peu plus vif, surtout au piléum, et par les tectrices sous-alaires roussâtres au lieu de blanchâtres. Nous nous croyons donc justifiés d'en faire une sous-espèce nouvelle. Les oiseaux de l'Ecuador oriental appartiennent probablement à la même forme.

Espèce nouvelle pour la faune péruvienne.

245. SIPTORNIS HUMILIS (Cab.).

Quatre oiseaux d'Ingapirca (mai et juin 1890). "Iris brun clair." La description originale de Cabanis est basée sur les oiseaux fournis par M. Jelski de Junin, d'où viennent aussi les peaux envoyées par M. Kalinowski.

246. SIPTORNIS MARAYNIOCENSIS, sp. nov.

Synallaxis humilis, Tacz. (nec Cab.) P. Z. S. 1874, p. 527; id. Orn. du Pérou, ii. p. 138 (descr. specim. e Maraynioc).

S. S. humili, *Cab.* (*e Junin*), *valde affinis, sed paulo major, corpore supra obscuriore, dorso pileoque distincte nigro-brunneo maculatis, tectricibus alarum superioribus minime fulvo marginatis, macula mentali magis extensa castaneo-* (*nec fulvo-*) *brunnea, rectricibus externis apice minus fulvo variis fuscescentioribus, necnon mandibula basi obscuriore distinguenda.*

Hab. in Peruvia centrali (Maraynioc, Tarma, Canchacso). Mus. Branicki et Berlepsch.

♂. Al. 70½, caud. 67, culm. 15¾, tars. 26½ mm.
♀ ♀. „ 69½–68½, „ 68½–67½, „ 15¼, „ 25½, 25¾ „

Un mâle et deux femelles de l'hacienda de Queta (Tarma) et de Canchacso (mai et juillet 1893). "Iris brun noirâtre, bec noir corné à mandibule inférieure d'un cendre foncé dans sa plus grande partie basale; pattes noirâtres teintées de verdâtre."

C'était par méprise que feu Taczanowski avait décrit les oiseaux de Maraynioc sous le nom de *S. humilis*, Cab. Heureusement il existe au Musée Berlepsch un individu typique de cette dernière espèce recueilli par Jelski à Junin, reçu directement par Cabanis, et qui nous permet de constater qu'il y a deux espèces très voisines mais bien distinctes, l'une (*S. humilis*) venant des environs de Junin, l'autre de Maraynioc, de Tarma etc. Cette dernière diffère de la *S. humilis* par la couleur plus foncée des parties supérieures, à taches noirâtres sur le dos et le piléum bien marquées qui manquent presque complètement aux oiseaux de Junin, par la surface de l'aile beaucoup plus foncé et sans bordures roussâtres, les tectrices sus-alaires presque uniformes et pas du tout bordées de fauve roussâtre; par les parties inférieures moins roussâtres, par la tache rousse au menton plus étendue et plus foncée; par la gorge et la région jugulaire plus distinctement striées de noirâtre, par les rectrices médianes non bordées de roussâtre et par les externes plus uniformes et plus noirâtres, moins variées de roussâtre dans la partie terminale; enfin par le bec un peu plus court et plus large.

247. SIPTORNIS TACZANOWSKII, Berl. et Stolzm.

Siptornis taczanowskii, Berl. et Stolzm. Ibis, 1894, p. 393.
Synallaxis flammulata, Tacz. Orn. Pérou, ii. p. 139.

Un oiseau de Maraynioc (2 décembre 1891) et une paire de Pariayacu, près de Maraynioc (août 1892 et janvier 1893).

248. SIPTORNIS GRAMINICOLA, Scl.

Une femelle de l'hacienda de Queta (25 juillet 1893).

Al. 67, caud. 77½, culm. 13, tars. 24 mm.

La *S. graminicola* se distingue de la *S. wyatti* surtout par l'extension de la couleur cannelle à la surface de l'aile, dont les tectrices supérieures sont d'un cannelle vif et uniforme, par la présence d'une strie cannelle aux barbes internes des deux rectrices médianes dans leur moitié basale, par la couleur roussâtre des parties inférieures du corps, par le bec plus court, la queue plus longue, etc.

249. SIPTORNIS ALBICAPILLA (Cab.).

Deux mâles adultes et un jeune femelle de Pariayacu (juillet et août 1892). "Iris brun ochracé, bec d'un brun clair, plus clair en dessous, pattes d'un gris olivâtre.

250. PSEUDOCOLAPTES BOISSONNEAUI FLAVESCENS, subsp. nov.

Pseudocolaptes boissonneaui, Tacz. (nec Lafr.) Orn. Pérou, ii. p. 145.

Ps. Ps. boissonneaui *e Columbia simillimus, sed gula juguloque flavescenti-albis (nec pure albis), dorsi maculis latioribus et rostro breviore distinguendus.*

♂ ad. Al. 116, caud. 104, culm. 20½, tars. 26½ mm.
♀ ad. „ 97, „ 95½, „ 23¾, „ 23½ „

Hab. in Peruvia centrali (Maraynioc) et septentrionali (Cutervo) et in Bolivia.

Maraynioc, Pariayacu: trois mâles et un femelle du novembre 1891 et d'août 1892.

Les oiseaux du Pérou central et septentrional (d'où il y a une femelle au Musée Berlepsch, recueillie à Cutervo le 9 mai 1879 par Jean Stolzmann) diffèrent des oiseaux de Bogotá par la gorge et les joues d'un blanc jaunâtre au lieu d'un blanc pur, pas les taches du dos un peu plus larges et prolongées jusqu'au milieu du dos (qui est presque immaculé chez les oiseaux de Bogotá), enfin par le bec plus court dans les deux sexes. Chez les oiseaux de la Bolivie les plumes allongées de la région auriculaire sont également lavées de jaunâtre, tandis qu'elles sont d'un blanc pur chez les oiseaux du Pérou comme chez les oiseaux typiques de la Colombie.

Le jeune mâle envoyé a le piléum d'un noir uniforme et le bec très-court et noir en entier. Nous n'avons pas vu d'oiseaux pareils d'Antioquia et de la Bolivie. Il paraît que les mâles *Pseudocolaptes* ont toujours le bec plus court que les femelles.

251. PHILYDOR SUBFLAVESCENS, Cab.

Une femelle de La Gloria (23 janvier 1891). "Iris brun foncé, bec brun en dessus, d'un corné clair en dessous, pattes d'un olive sale."

L'oiseau envoyé par Kalinowski a la strie surcilière et une

bande qui s'étend de la base de la mandibule inférieure jusqu'aux couvertures auriculaires d'un roux ochreux vif. Le dessus du corps est d'un olive plus pâle et plus grisâtre, et les parties inférieures sont d'un blanc jaunâtre sale plus pâle que chez le *Ph. ruficaudatus*. Le bec et les ailes sont un peu plus courts que chez cette espèce.

MM. Cabanis et Taczanowski ont décrit ces oiseaux à sourcil d'un roux ochreux comme des *jeunes* du *Ph. subflavescens* ce que est peut-être un erreur. Notre oiseau paraît complètement adulte. En outre *l'adulte* du *Ph. subflavescens*, Cab., est dit-on le même que le *Ph. ruficaudatus* (Lafr. et d'Orb.). Dans ce dernier cas il faudra probablement séparer les oiseaux à sourcil roux comme espèce distincte (*Ph. euophrys*, nob.).

Dimensions de l'oiseau de La Gloria: aile 83, queue 72½, culmen 15¾, tarse 18½ mm.

252. PHILYDOR SUBFULVUS, Scl.?

Une femelle de La Gloria (22 janvier 1891). "Iris brun foncé." Aile 84, queue 67, culmen 15¾, tarse 19½ mm.

Nous ne possédons pas d'exemplaires authentiques du *Ph. subfulvus*, Scl., pour comparer à notre femelle. Celle-ci a les petites tectrices des épaules d'un roux brun semblable à celui des tectrices sous-caudales, ce qui n'est pas mentionné dans la description de Mr. Sclater. En outre notre oiseau présente des dimensions plus petites que celui décrit par cet auteur.

253. ANABAZENOPS STRIATICOLLIS (Scl.)

Garita del Sol: un mâle du 22 juillet 1891. S'accorde en général avec un oiseau de Bogotá, mais le dessous du corps est plus olivâtre, moins roussâtre, et la couleur du piléum est presque la même que celle du dos, tandis qu'elle est plus foncée et différente de celle du dos chez l'oiseau de Bogotá. Il faudra examiner le type de l'*Anabates montanus*, Tsch., qui est peut-être la même que l'*A. striaticollis*.

254. XENOPS GENIBARBIS APPROXIMANS (Pelz.).

La Gloria: une femelle du 19 février 1891.

Al. 62, caud. 47, culm. 13½, tars. 14½ mm.

Peut-être pourrait-on nommer cette forme *X. genibarbis mexicanus*, Scl. C'est la forme occidentale plus grande du *X. genibarbis*, Ill., du Brésil oriental.

255. XENOPS RUTILUS HETERURUS (Cab. et Heine).

Xenops rutilus, Tacz. Orn. du Pérou, ii. p. 160.

La Gloria (août 1890), Borgoña (avril 1891) et Garita del Sol (septembre 1891): deux mâles et une femelle. "Iris brun."

256. SITTASOMUS AMAZONUS, Lafr.

Une femelle de Garita del Sol (18 août 1891) et un mâle de San Emilio (24 mai 1893).

257. MARGARORNIS PERLATA (Less.).

Six exemplaires de Maraynioc du décembre 1891, août, octobre et décembre 1892, et mai 1893.

Ces oiseaux ont le blanc de la gorge, de la strie surcilière et des gouttes plus distinctement lavé de jaunâtre que les oiseaux de Bogotá. Les oiseaux de l'Ecuador paraissent intermédiaires.

258. GLYPHORHYNCHUS CUNEATUS CASTELNAUI (Des Murs).

La Gloria : un mâle du 18 janvier 1891.

Al. 81½, caud. 75¾, culm. 12½, tars. 16½ mm.

L'oiseau envoyé est un peu plus grand (à ailes et bec sensiblement plus longs) et il a le plumage plus pâle (le dos moins brunâtre) que des échantillons du Haut-Amazone.

259. DENDRORNIS ROSTRIPALLENS, Des Murs ?

Une femelle de La Merced (12 mars 1891). "Iris brun foncé, bec blanc olivâtre sale, pattes d'un bleuâtre sale."

Aile 112, queue 98½, culmen 36½, tarse 25½ mm.

Cette femelle se distingue des oiseaux du Haut-Amazone par la gorge et le fond du cou inférieur blanchâtre (au lieu de roussâtre). Il y a pourtant sur la gorge de nouvelles plumes qui commencent à pousser d'une nuance roussâtre comme chez les oiseaux de l'Amazone. Cet oiseau présente aussi de fines bordures apicales noirâtres aux plumes du cou inférieur qui manquent chez les oiseaux de l'Amazone. Enfin les ailes sont un peu plus courtes. Ces différences sont probablement individuelles, car la femelle de La Merced nous paraît jeune.

260. DENDRORNIS TRIANGULARIS (Lafr.), subsp.

Une paire de Garita del Sol (juillet et octobre 1891).

♂. Aile 120½, queue 102, culmen 32½, tarse 21 mm.
♀. „ 111, „ 93, „ 29½, „ 21 „

Ces oiseaux ressemblent le plus aux spécimens de la Bolivie (*D. triangularis*, Lafr., typique) que Berlepsch a reçus du voyageur Garlepp. Ils ne s'en distinguent que par des dimensions plus fortes, notamment par le bec plus long.

La forme colombienne, nommée *D. triangularis* par Mr. Sclater, diffère de la vraie *D. triangularis* par le croupion moins varié de roux et par les taches du dessous du corps beaucoup plus grosses à bordures noirâtres. Nous nommerons cette forme *D. triangularis bogotensis*, Berl. et Stolzm.

La *D. triangularis erythropygia*, Scl., a les taches du dessous du corps aussi grosses que la *D. t. bogotensis*, mais elle présente des taches plus larges sur le haut du dos et le roux du croupion est plus étendus.

261. DENDRORNIS CHUNCHOTAMBO (Tsch.).

Dendrornis ocellata, Tacz. Orn. Pérou, ii. p. 179.

Un mâle et une femelle de La Gloria (août 1891 et janvier 1891).

Dimensions :—

♂. Aile 99, queue 90, culmen 33, tarse 21 mm.
♀. „ 99, „ 90½, „ 33, „ 20½ „

Avant d'avoir examiné le type de la *D. ocellata*, Spix, nous préférons la dénomination donnée à cette espèce par M. de Tschudi, savoir *D. chunchotambo*, dont Berlepsch a examiné un spécimen typique appartenant au Musée de Kiel.

L'oiseau de La Gloria s'accorde avec un individu de Huayabamba, Pérou du nord (coll. Garlepp) et n'en diffère que par son bec un peu plus long.

262. XIPHOCOLAPTES PROMEROPIRHYNCHUS (Less.), subsp.?

La Gloria : une femelle d'août 1890. "Iris brun foncé."

Long. totale 331, envergure 441, aile 141½, queue 115, culmen 49½, tarse 32½ mm.

L'oiseau envoyé par Kalinowski se distingue des individus du *X. promeropirhynchus* de Bogotá par le bec plus long, plus fort et blanchâtre, par les stries du sommet de la tête plus larges, par le dos plus olivâtre, moins roussâtre, par le roux brun du croupion plus clair, par la couleur des parties inférieures plus olivâtre et par le menton plus blanchâtre. Les stries fauves des parties inférieures sont plus larges. Presque pas de maculature noirâtre au milieu du ventre.

Par la couleur du bec il se rapproche au *X. p. compressirostris* (Tacz.), mais s'en distingue par les stries du piléum plus larges.

263. XIPHOCOLAPTES PHÆOPYGUS, sp. nov.

X. X. lineatocephalo (*Gray et Mitch.*) *ex Bolivia forsan maxime affinis, differt uropygio rufescente olivaceo-brunneo* (*nec castaneo*), *pileo dorso concolore minime striato, gula sordidiore rufescenti-alba fusco variegata, alis caudaque fere brevioribus.*

♂. Al. 138½, caud. 120, culm. 42¾, tars. 30½ mm.
♀. „ 134, „ 118, „ 47½, „ 30½ „

Hab. in Peruvia centrali circum Maraynioc (typus in Mus. Branicki).

Une paire de Culumachay, Maraynioc, du 24 août 1892.

Cette espèce nouvelle est tout-à-fait distincte du *X. promeropirhynchus* (Less.) de la Colombie, dont elle diffère par la couleur presque uniforme des parties supérieures, qui est d'un brun olive très pâle, presque grisâtre. Le piléum est tout-à-fait de la même couleur que le dos et non pas noirâtre comme chez le *X. promeropirhynchus*. Il n'y a pas trace de stries claires ni sur le piléum ni sur le dos. La différence la plus frappante consiste dans la couleur du croupion qui est d'un brun olivâtre un peu plus obscur que le dos au lieu d'un brun châtain. Ce ne sont que les tectrices sus-caudales qui présentent un brun châtain pâle mélangé d'un brun olivâtre. Les parties inférieures sont d'un brun olive au lieu d'un brun roussâtre saturé ; les stries claires de la poitrine sont bordées latéralement de noirâtre, ce qui n'est pas le cas chez

le *X. promeropirhynchus*. La gorge est d'un blanc roussâtre plus terne et plus variée de stries brunâtres. Le bec est corné comme chez l'autre espèce.

Le *X. phœopygus* paraît le plus proche au *X. lineatocephalus*, Gray et Mitch., de la Bolivie, dont *H. simpliciceps*, Lafr., est probablement synonyme.

Comparés à plusieurs individus de la Bolivie du Musée Berlepsch, les deux oiseaux de Maraynioc ne diffèrent que par le croupion d'un brun olive au lieu de châtain, par le pileum tout-à-fait semblable au dos au lieu d'être plus obscur ou noirâtre, par le manque complet de stries au piléum, par la couleur du dessus et du dessous un peu plus pâle, par la gorge d'un blanc roussâtre plus terne et plus variée de brun olivâtre, enfin par les ailes et la queue généralement plus courtes.

264. PICOLAPTES FUSCICAPILLUS, Pelz.

Un mâle adulte de Borgoña (29 mai 1891). "Iris brun clair, bec corné clair, pattes olives."

Aile 96½, queue 86½, culmen 29¾, tarse 18½ mm.

L'individu envoyé par Kalinowski s'accorde avec la description de M. de Pelzeln basée sur des oiseaux de Matogrosso.

Espèce nouvelle pour la faune péruvienne.

265. PICOLAPTES LACRYMIGER WARSZEWICZI (Cab. et Heine).

Picolaptes warszewiczi, Tacz. Orn. Pérou, ii. p. 173.

Une paire de Maraynioc du 10 août 1892.

♂. Al. 106, caud. 98½, culm. 26½, tars. 20 mm.
♀. „ 104, „ 89½, „ 26¾, „ 19¾ „

Ces oiseaux ne diffèrent d'une femelle de Tambillo, Pérou du nord (coll. Stolzmann, Mus. Berlepsch), que par les parties supérieures et inférieures d'un olivâtre plus obscur, moins roussâtre, par le bec plus court et la mâchoire un peu plus pâle. Il faudra réexaminer le type du *P. warszewiczi* dans le Musée Heinéanum envoyé du Pérou par Warszewicz.

266. DENDROCOLAPTES VALIDUS, Tsch.

Borgoña : un mâle adulte du 23 avril 1891. "Iris brun foncé, bec brun à mandibule inférieure d'un brun plombé, pattes d'un plombé olivâtre."

Aile 136½, queue 123½, culmen 39½, tarse 27½ mm.

Cet oiseau paraît appartenir au vrai *D. validus*, Tsch., dont le type provient de la même région. Un oiseau de Bogotá et un autre d'Antioquia du Musée Berlepsch diffèrent par les ailes un peu plus courtes, par le bec un peu plus mince et plus noirâtre, par les bandes noirâtres de l'abdomen, des sous-caudales et des sous-alaires plus étroites et par les plumes du cou inférieur marquées de macules latérales noires au lieu de bordures. L'oiseau du Pérou a le châtain du croupion plus restreint et présente des bandes noirâtres sur le croupion et les scapulaires, bandes qui manquent

complètement aux oiseaux de la Colombie. Enfin les stries scapales roussâtres du dos supérieur et médian sont mieux marquées chez l'oiseau du Pérou.

Fam. Formicariidæ.

267. Thamnophilus melanurus debilis, subsp. nov.

Th. Th. melanuro, *Gld., simillimus, differt rostro debiliore, tarsis attamen longioribus, rectricibus duabus utrinque externis tectricibusque alarum superioribus maris apicibus latius albo marginatis, necnon colore feminæ corporis superioris brunneo obscuriore.*

	Long. alæ.	Caudæ.	Culminis.	Tarsi.
♂	96	80½	28¾	35½ mm.
♀ ♀	92½–92	79½–78½	27½–27¼	35½ „

Hab. in Peruvia centrali.

La Merced (août 1890 et décembre 1891): un mâle et trois femelles. "Iris rouge ochreux, bec noir, pattes d'un plombé bleuâtre."

Ces oiseaux se distinguent d'un mâle et d'une femelle de Samiria, Haut-Amazone (coll. Hauxwell), du Musée Berlepsch, par le bec moins large et plus court, les tarses au contraire plus longs. Le mâle a les deux rectrices externes et les tectrices susalaires bordées plus largement de blanc. Il présente aussi des bordures blanches aux petites tectrices de l'épaule ce qui n'est pas le cas chez le *Th. melanurus* de Samiria. Les femelles de La Merced diffèrent également d'une femelle de Samiria par le roux brun du dessus du corps plus foncé.

268. Thamnophilus melanochrous, Scl. et Salv.

Thamnophilus melanochrous, Scl. et Salv. P. Z. S. 1876, p. 18, pl. iii. (typus ex Huiro Peruviæ mer.); Tacz. Orn. Pérou, ii. p. 11.

Thamnophilus subandinus, Tacz. P. Z. S. 1882, p. 29 (Chachapoyas, Chirimoto, Tamiapampa); id. Orn. Pérou, ii. p. 6.

Thamnophilus subandinus major, Tacz. Orn. Pérou, ii. p. 7 (Paltaypampa).

Six individus (♂ ♂ et ♀ ♀) de Garita del Sol (juillet, août et septembre 1891). "Iris brun foncé, bec noir à mandibule inférieure bleuâtre, pattes d'un plombé bleuâtre."

♂. Aile 73, queue 67½, culmen 16½, tarse 22½ mm.
♀. „ 69, „ 66, „ 16¾, „ 23 „

Nous n'avons pas trouvé des différences constantes entre les oiseaux de Chachapoyas (*Th. subandinus*, Tacz.), de Vitoc (*Th. s. major*, Tacz.) et un mâle de Huiro du Musée Berlepsch, recueilli par Mr. Orton (*Th. melanochrous*, Scl. et Salv.).

269. Thamnophilus variegaticeps, sp. nov.

? *Thamnophilus radiatus*, Tacz. (nec Vieill.), Orn. Pérou, ii. p. 20, part.

♂ *mari* Th. nigricristati subradiati, *Berl., ex Amazonia sup.*

simillimus, sed differt pilei crista breviore, pilei medii plumis vexillo interno (nonnullis etiam vexillo externo) albo marginatis vel maculatis, fasciis dorsi latioribus et æqualioribus, necnon differt rostro breviore et debiliore.

	Long. alæ.	Caudæ.	Culminis.	Tarsi.
♂ ♂	76½–73½	67–62	20¾–19¾	25½–24½ mm.
♀	79½	67½	19¾	26½ „

Hab. in Peruvia centrali.

Huit individus (♂ ♂ et ♀ ♀) de La Merced (juillet et août 1890, janvier et avril 1891). "Iris jaune olivâtre, bec noir à mandibule inférieure bleuâtre à la base."

Cette espèce nouvelle est très proche du *Th. nigricristatus*, Lawr., ou plutôt de la forme plus grande nommée par Berlepsch *Th. subradiatus* (du Haut-Amazone). Le mâle diffère du mâle de cette espèce par la huppe de la tête beaucoup plus courte et variée au milieu par des bordures ou macules latérales blanches vers la base des plumes. Les raies blanches du dos sont plus régulières, plus larges et plus rapprochées entre elles. C'est pourquoi le dos paraît moins noirâtre. Enfin les bandes des rectrices sont plus étendues vers la tige (presque complètes et non en forme de taches).

La femelle paraît distincte des femelles du *Th. nigricristatus* et du *Th. doliatus* par le roux brun de la huppe et du dos plus foncé, et par le roux de rouille de l'abdomen plus intense.

On peut dire que cette espèce nouvelle est à peu près intermédiaire entre le *Th. nigricristatus* et le *Th. doliatus*. Peut-être l'oiseau de Moyobamba décrit par Taczanowski sous le nom de *Th. tenuifasciatus*, Lawr., appartient-il à notre *Th. variegaticeps*.

270. THAMNOPHILUS PALLIATUS PUNCTICEPS (Scl.)?

Thamnophilus palliatus, Tacz. (nec Licht.) Orn. Pérou, ii. p. 17.

? *Thamnophilus puncticeps*, Scl. Cat. B. Brit. Mus. xv. (1890) p. 17 (Bolivia et Ecuador).

Garita del Sol: une paire (août 1891). "Iris chez le mâle d'un bleu cendré, chez la femelle d'un cendré jaunâtre, bec noir à mandibule inférieure bleuâtre, pattes bleuâtres.

♂. Al. 74,	caud. 68½,	culm. 20¾,	tars. 24½ mm.
♀. „ 74½,	„ 69,	„ 17¾,	„ 24¼ „

Les différences indiquées par Mr. Sclater entre son *Th. puncticeps* (de la Bolivie et de l'Ecuador) et le *Th. palliatus* (du Brésil) ne paraissent pas constantes. Notre mâle adulte de Garita ne diffère des oiseaux de Bahia que par le brun du dos et des ailes plus pâle et par la région jugulaire moins variée de blanchâtre ou d'un noirâtre presque uniforme. Il a le piléum d'un noir uniforme comme un mâle de Bahia, tandis qu'un autre mâle de Bahia du Musée Berlepsch y présente des taches blanches qui, selon Sclater, seraient caractéristiques du *Th. puncticeps*. Les bandes noires et blanches de l'abdomen sont de la même largeur que chez les oiseaux de Bahia.

271. THAMNISTES RUFESCENS, Cab.

Un mâle et une femelle de La Gloria (janvier et février 1891). "Iris rouge, bec noir en dessus, plombé clair en dessus, pattes d'un plombé olivâtre."

♂. Aile 76½, queue 73, culmen 17¾, tarse 18½ mm.
♀. „ 72, „ 72, „ 17½, „ 18½ „

Cette espèce très rare se distingue du *Th. æquatorialis*, Scl., par le bec plus petit et les parties inférieures, les côtés de la tête et les sourcils plus roussâtres, le brun des parties supérieures également plus lavé de roussâtre, enfin par le piléum moins roussâtre.

272. DYSITHAMNUS SEMICINEREUS, Scl.

Trois individus de La Gloria (janvier) et de Garita del Sol (septembre 1891).

Ces oiseaux s'accordent bien avec le oiseaux typiques de Bogotá, mais ils présentent des bordures blanchâtres un peu plus larges à la pointe des rectrices.

273. DYSITHAMNUS DUBIUS, Berl. et Stolzm.

Dysithamnus dubius, Berl. et Stolzm. Ibis, 1894, p. 393.

Un mâle adulte de La Merced du 26 août, 1890. "Iris rouge sale."

274. MYRMOTHERULA LONGICAUDA, sp. nov.

Myrmotherula longicauda, Berl. et Stolzm. Ibis, 1894, p. 394.

Myrmotherula surinamensis, Tacz. (nec Gmel.) P. Z. S. 1882, p. 30.

Myrmotherula multostriata, Tacz. (nec Scl.) Orn. Pérou, ii. p. 39.

Un mâle adulte de Chontabamba (Vitoc) du 28 août 1891 et deux femelles de La Merced et de La Gloria du 21 juillet 1890 et du 14 novembre 1891. "Iris brun noirâtre."

275. MYRMOTHERULA SORORIA, Berl. et Stolzm.

Myrmotherula sororia, Berl. et Stolz. Ibis, 1894, p. 396.

Myrmotherula gutturalis, Tacz. (nec Scl. et Salv.) Orn. Pérou, ii. p. 72.

La Gloria (juillet 1890 et janvier 1891) et La Merced (septembre 1890): un mâle et trois femelles.

276. HERPSILOCHMUS MOTACILLOIDES, Tacz.

La Gloria (8 août 1890) et Garita del Sol (18 juillet et 15 août 1891): trois mâles et une femelle.

Dans la description originale de cette espèce (P. Z. S. 1874, p. 137) feu Taczanowski disait: "Cette espèce est très voisine du *H. atricapillus*, mais elle s'en distingue principalement par la tacheture de l'occiput." Au contraire, les trois mâles envoyés par Kalinowski ne présentent aucune trace de taches blanches sur l'occiput noir, c'est pourquoi nous présumons que Taczanowski

a décrit comme mâle adulte un jeune mâle, ou puet-être même une femelle. Berlepsch, ayant fait des notes d'après un spécimen typique du *H. atricapillus*, Pelz., du Musée de Vienne, il y a quelques années, a pu constater les différences suivantes entre cette espèce et le *H. motacilloides*: cette dernière a la queue beaucoup plus longue (53 à 59 au lieu de 43 mm.), les ailes également plus longues (54 à 56½ au lieu de 51 mm.). Le mâle a les parties inférieures d'un blanc fortement lavé de jaunâtre au lieu d'un blanc grisâtre. Les deux rectrices externes sont presque entièrement blanches à l'exception du tiers basal qui est noir. Au contraire chez le *H. atricapillus* ce n'est que le tiers apical de ces rectrices qui est blanc. Les autres rectrices externes présentent également plus de blanc et les subexternes ont la barbe externe presque entièrement blanche.

La femelle paraît distincte de celle du *H. atricapillus* par le front roussâtre et par les parties inférieures d'un blanc jaunâtre au lieu d'un blanc ochreux.

Il nous paraît donc utile de donner une nouvelle diagnose du *H. motacilloides*:—

H. ♂ ad. pileo ad nucham usque striaque lata ante- et post-oculari nigris unicoloribus, superciliis capitisque lateribus griseo-albis, marginibus plumarum nigrescentibus; dorso toto cinereo in adultis nigro maculato, plumis nonnullis basi interdum niveis; corpore subtus tectricibusque alarum caudæque inferioribus flavescenti albis, gula pectorisque lateribus griseo lavatis; tectricibus alarum nigris late albo terminatis, remigibus nigricantibus, primariis secundariisque extus anguste griseo albo, tertiariis scapularibusque latius albo marginatis; rectricibus externis—basi extrema nigra excepta—albis, cæteris nigris albo terminatis, subexternis dimidio apicali et vexillo externo—nisi in basi—albis, mediis fere omnino nigris, vexillo externo subtiliter griseo, interno anguste albo apiceque latius albo marginatis.

♀ mari similis, sed fronte late rufescente pilei plumis ante apicem albo marginatis, dorso olivaceo griseo, necnon remigibus olivaceo-griseo marginatis distinguenda.

	Long. tota.	Al. exp.	Alæ.	Caudæ.	Culm.	Tars.	
♂ ♂.	142–140	192–185	56½–54	59–53	15½–14	17½	mm.
♀.	145	183	55½	53¾	14½	17½	„

Hab. in Peruvia centrali.

277. FORMICIVORA CAUDATA, Scl.

Une paire de Garita del Sol du 12 mars 1893.

♂. Al. 54⅓, caud. 74, culm. 14⅔, tars. 19½ mm.
♀. „ 53, „ 75, „ 15¼, „ 19½ „

Espèce nouvelle pour la faune péruvienne.

Le mâle adulte se distingue d'un ♂ ad. d'Antioquia par le bec et la queue sensiblement et les ailes un peu plus courtes, par les stries noirâtres de la gorge plus larges et plus marquées, les stries des côtés de la tête et du cou également plus larges. Nous n'avons

pas examiné d'individus de Bogotá, d'où provient le type de Mr. Sclater.

Comparé à trois mâles adultes de Surupata et Cayandeled (Ecuador occ.—coll. Stolzmann et Siemiradzki) le mâle de La Gloria s'accorde presque dans tous les détails et ne diffère que par le bec un peu plus court, la queue un peu plus longue et les rectrices d'une couleur plus schistacée moins olivâtre, enfin par le blanc de la gorge et de la poitrine plus pur et par les stries noirâtres de la gorge un peu plus larges et plus prononcées.

La femelle de Garita del Sol ne diffère d'une femelle de Chaquarpata, Ecuador (coll. Stolzmann), que par le roux du piléum plus intense et plus étendu vers la nuque et par les couleurs généralement un peu plus vives.

La première a les dimensions généralement plus fortes et le bec plus fort et plus long que celle de Chaquarpata.

Avant de caractériser cette forme il faudrait examiner plusieurs individus.

278. CERCOMACRA APPROXIMANS, Pelz.?

? *Cercomacra tyrannina*, Tacz. (nec Scl.) Orn. Pérou, ii. p. 54.

Garita del Sol (juillet, août et septembre 1891): trois mâles et une femelle.

♂ ad. Aile 69, queue 66, culmen 17¾, tarse 22¾ mm.

Nous n'avons pas d'individus typiques de la *C. approximans* de Matogrosso pour comparer, mais les mâles de Garita diffèrent par plusieurs détails des mâles de Mapoto, Ecuador or. (coll. Stolzmann), que Mr. Sclater (Cat. B. Brit. Mus. xv. p. 266) a placés sous la *C. approximans*. Les oiseaux de Garita ont le plumage plus noirâtre en dessus et en dessous, les bordures blanches à la pointe des tectrices sus-alaires beaucoup plus étroites (presque en forme des petits points sur les tectrices les plus grandes) et ne présentent aucune trace de bordures blanches apicales aux rectrices externes. Les côtés du basventre, les tectrices, les sous-caudales et le croupion ne sont pas du tout lavés d'olive. Les ailes et la queue sont un peu plus longues. Peut-être faudra-t-il séparer les oiseaux du Pérou central comme forme distincte. *C. hypomelæna*, Scl., de Cosnipata, paraît voisine ou peut-être identique.

279. PYRIGLENA MAURA PICEA (Cab.).

Pyriglena picea, Tacz. Orn. Pérou, ii. p. 56.

La Gloria (juillet et août 1890 et janvier 1891) et Garita del Sol (juillet 1891): trois mâles et une femelle.

♂ ♂. Aile 79–77, queue 80½–78, culm. 18¾–18, tarse 32–30½ mm.

Les oiseaux de Garita ne se distinguent des oiseaux de Matogrosso que par la queue un peu plus longue et le bec un peu plus large. Le type de la *P. maura* provient de Minas Geraes.

280. MYRMECIZA SPODIOGASTRA, Berl. et Stolzm.

Myrmeciza spodiogastra, Berl. et Stolzm. Ibis, 1894, p. 397.

Un mâle et une femelle de Borgoña du 29 avril 1891.

281. Hypocnemis subflava, Cab.

Deux mâles de La Merced (26 août et 12 septembre 1890). "Iris brun fonce."

♂. Aile 58, queue 41½, culmen 16, tarse 20 mm.

Ces individus se distinguent du mâle qui a servi de type à M. Cabanis (Musée de Varsovie) par la couleur du dessous, qui est beaucoup plus intense, presque jaune de soufre au lieu de blanc jaunâtre. Berlepsch a aussi reçu cette espèce de la Bolivie par Garlepp.

282. Hypocnemis lepidonota, Scl. et Salv.

La Merced (10 avril 1891): une femelle. "Iris brun foncé, bec noir, pattes d'un plombé bleuâtre."

283. Hypocnemis schistacea, Scl.

Trois mâles de La Merced (août 1890), de La Gloria (janvier) et de Borgoña (mai 1891). "Bec et pattes noirs."

Aile 68–67, queue 54½–54, culmen 19¾–19¼, tarse 25–24½ mm.

284. Hypocnemis leucophrys (Tsch.).

La Merced: trois mâles d'août 1890 et du mars 1891. "Iris chez un mâle, rouge-cerise sale; chez l'autre, brun foncé."

Aile 72¾–71, queue 53½, culmen 17½–18¾, tarse 24¾–23¾ mm.

Les oiseaux de Bogotá ont l'abdomen un peu plus foncé et le dos cendré moins bleuâtre; ceux de la Guyane anglaise ont l'abdomen beaucoup plus clair, le front moins largement blanchâtre et les ailes et la queue un peu plus courtes.

285. Chamæza olivacea, Tsch.

Deux mâles adultes de La Gloria (16 août 1890) et de la Esperanza, Vitoc (26 mars 1893). "Iris brun foncé."

Aile 97½, queue 62½–65, culmen 19¾–27½, tarse 36½–38½ mm.

Ces oiseaux s'accordent parfaitement avec la description de Tschudi de la *Ch. olivacea*, mais non pas avec la diagnose de cette espèce donnée par Mr. Sclater (Cat. Brit. Mus. xv. p. 307), qui est probablement basée sur des individus de Bogotá ou de la Bolivie.

L'oiseau de La Gloria diffère au premier coup d'œil des individus de Bogotá du Musée Berlepsch par la couleur de la gorge et de la poitrine, qui est d'un roux-ochreux vif au lieu de blanche. Les côtés de la poitrine sont lavés d'olive et les flancs lavés d'un roux ochreux, ce qui n'est pas le cas chez les oiseaux de Bogotá. Les bordures noirâtres des plumes de la poitrine et des flancs sont un peu plus étroites. Les parties supérieures sont d'un vert olive au lieu d'un brun olivâtre. La strie surcilière bien marquée chez les oiseaux de Bogotá manque presque complètement chez l'oiseau de La Gloria. La bande noirâtre antéapicale qui, chez les oiseaux de Bogotá, se manifeste sur toutes les rectrices, manque complètement sur les rectrices médianes chez l'oiseau de La Gloria tandis qu'elle est très-bien marquée sur les rectrices externes.

L'oiseau péruvien a les ailes, la queue et les tarses plus longs, le bec au contraire un peu plus court que celui de Bogotá.

Il faudra donc donner un nouveau nom à l'oiseau de Bogotá, et par conséquent nous proposons celui de *C. columbiana*, sp. nov.

286. GRALLARIA REGULUS, Scl.

La Gloria : une femelle du 6 février 1891.

287. GRALLARIA RUFULA OBSCURA, subsp. nov.

Grallaria rufula, Tacz. Orn. Pérou, ii. p. 88.

G. G. rufulæ (Lafr.) *simillima, sed colore supra obscuriore, magis olivaceo vel minus rufo-brunneo, fronte imprimis minus rufescente, necnon alis caudaque paulo longioribus distinguenda. Long. alæ* 90, *caudæ* 46½, *culminis* 19½, *tarsi* 44½ *mm.*

Hab. in Peruvia centrali (Mus. Branicki).

Une femelle de Maraynioc (24 novembre 1891).

Cette femelle unique présente la couleur du dessus du corps plus olivâtre, moins roussâtre, que les oiseaux de Bogotá et de l'Ecuador. Cette différence se manifeste surtout au front et sur les côtés de la tête. Les ailes et la queue sont aussi un peu plus longues que chez les oiseaux de Bogotá et de l'Ecuador qui nous ont servi de comparaison.

288. GRALLARIA ANDICOLA (Cab.).

Une femelle d'Ingapirca (juin 1890) et un mâle de Pariayacu (7 août 1892). " Iris brun foncé."

♂. Al. 93½, caud. 43½, culm. 22¾, tars. 45½ mm.
♀. „ 96½ „ 45½ „ 21¾ „ 46½ „

On dit que les oiseaux typiques du Musée Universitaire de Varsovie proviennent de la même contrée que nos spécimens.

289. CONOPOPHAGA CASTANEICEPS BRUNNEINUCHA, subsp. nov.

Conopophaga castaneiceps, Tacz. Orn. Pérou, ii. p. 88 (partim).

C. ♂ *huic* C. castaneicipitis (*Scl.*) *simillimus, sed dorso alisque extus obscure rufo-brunneis fere unicoloribus (dorso minime griseo et nigro variegato), pileo nuchaque dorso concoloribus (nec rufis), fronte solummodo rufa ; abdomine medio purius albo, gula capitisque lateribus nigrescentioribus, rostro breviore et angustiore, mandibula fere omnino alba (nec dimidio apicali fuscescente), necnon alis caudaque longioribus distinguendus.*

♀ *a fœmina* C. castaneicipitis *pileo posteriore nuchaque brunneis nec rufis forsan distinguenda.*

	Long. alæ.	Caudæ.	Culminis.	Tarsi.	
♂....	78	49	12¾	28½	mm.
♀♀..	75½–72½	47½–43½	17½–13½	29¾–28½	„

Hab. in Peruvia centrali.

Un mâle et deux femelles de Garita del Sol et de La Gloria (août 1890, août et octobre 1891). "Iris brun foncé, bec noir à mandibule inférieure blanchâtre, pattes d'un cendré bleuâtre."

Le mâle de La Garita se distingue au premier coup d'œil d'un mâle de Bogotá (Mus. Berlepsch) par le dos et les ailes d'un brun saturé et foncé, tandis que chez l'oiseau de Bogotá ces parties sont d'un olive terne ou moins brunâtre et le dos varié de grisâtre à larges bordures apicales noirâtres. Chez l'oiseau de Garita le front seul est d'un roux vif, mais la partie postérieure du piléum et la nuque sont d'un brun foncé roussâtre, de même que le dos. Chez l'oiseau de Bogotá au contraire presque tout le piléum est roux, seulement un peu plus foncé dans la partie postérieure, avec bordures apicales des plumes noirâtres. Ensuite chez l'oiseau de Garita le milieu de l'abdomen est presque blanc pur seulement un peu varié de grisâtre, tandis que chez celui de Bogotá cette partie de l'abdomen est d'une couleur d'ardoise un peu plus pâle que la poitrine. La couleur d'ardoise de la gorge et des côtés de la tête est plus noirâtre. Les ailes et la queue sont plus longues, le bec plus petit. Enfin la mandibule inférieure est presque uniformement blanchâtre, tandis que chez l'oiseau de Bogotá le tiers apical en est noirâtre.

Nous n'avons pas pour comparer de femelles de Bogotá, mais il nous semble, que les femelles du Pérou diffèrent par le piléum postérieur brunâtre au lieu de roux, car Mr. Sclater dit que la femelle ressemble au mâle par la coloration des parties supérieures.

Un mâle de Huayabamba, Pérou du nord (coll. Garlepp; Mus. Berlepsch), ressemble par la couleur du piléum et dans d'autres détails à l'oiseau de Bogotá. Il n'en diffère que par la couleur du dos plus brunâtre sans mélange de grisâtre et sans bordures apicales noirâtres, enfin par le milieu de l'abdomen blanchâtre (mais moins pur et moins étendu que chez l'oiseau de Garita). Le dernier caractère ne paraît pas constant, car Taczanowski a décrit un oiseau de Huambo (vallée de Huayabamba—coll. Stolzmann), sans blanc au milieu du ventre. Par la couleur de la gorge et la forme du bec, ainsi que par la couleur de la mandibule inférieure, l'oiseau de Huayabamba ressemble parfaitement à celui de Bogotá. L'oiseau du Pérou du nord paraît donc très proche de celui de Bogotá, ou peut-être même identique.

La *C. castaneiceps* de Sclater est basée sur un oiseau de Bogotá ainsi que sur un oiseau du Pérou recueilli par Tschudi. Quant à ce dernier on pourrait soupçonner, d'après la description de Taczanowski, qu'il provenait du Pérou du nord. Taczanowski avait déjà démontré la différence entre cet oiseau et un mâle du Pérou central.

290. CORYTHOPIS ANTHOIDES HUMIVAGANS (Tacz.).

Une femelle de La Gloria (août 1890). "Iris brun foncé."

Fam. Pteroptochidæ.

291. Scytalopus femoralis, Tsch.

Un ♂ ad. de Maraynioc du 28 novembre 1891. "Iris brun foncé, bec noire, pattes brunes."

Long. de l'aile 72, queue 49½, culmen 16¼, tarse 30, doigt médian avec l'ongle 28 mm.

Cet oiseau s'accorde en général avec la description de Taczanowski (Orn. Pérou, i. p. 532) faite d'après un spécimen typique du *S. femoralis* du Musée de Neuîchâtel, mais il semble que les pattes de notre oiseau sont beaucoup plus fortes. Taczanowski, en parlant d'une jeune femelle de Ray-Urmana (vallée de Huayabamba—coll. Stolzmann), dit que celle-ci aurait les pattes plus fortes que l'individu typique du *S. femoralis*; mais notre oiseau de Maraynioc a les pattes beaucoup plus fortes encore que la femelle de Ray-Urmana.

Le mâle de Maraynioc se distingue de deux individus du *S. micropterus* (Scl.) [*S. analis*, Lafr.?] de l'Ecuador par les ailes plus longues, le bec et les pattes plus longs et plus forts, le plumage noir schistacé très intense au lieu d'un noir brun grisâtre, l'uropygium à peine lavé de brun roussâtre avec des raies noirâtres peu distinctes. Les raies noirâtres et roussâtres des côtés du bas-ventre plus foncées et moins répandues. La mandibule inférieure et les pieds plus noirâtres, les ongles des doigts presque blanchâtres.

En cas que notre oiseau ne serait pas identique au *S. femoralis*, Tsch., nous lui réservons le nom de *S. macropus*.

292. Scytalopus sylvestris, Tacz.

Un mâle adulte de Garita del Sol (29 juin 1891) et un autre plus jeune de Maraynioc, Pariayacu (31 juillet 1892). "Iris brun foncé bec noir, pattes d'un brun grisâtre."

Nos oiseaux s'accordent à peu près avec la description originale de Taczanowski du *S. sylvestris*. En outre ils viennent des mêmes localités que les oiseaux typiques. Cette espèce est sans doute très proche du *S. senilis*, Lafr., de Colombie (ou au moins de l'espèce que Mr. Sclater prend pour le *S. senilis*, Lafr.), mais elle en diffère par le dessus du corps, dont la couleur générale est ardoisée noirâtre presque uniforme (au lieu de brunâtre) et par la couleur de la gorge et de la poitrine, qui est plus claire et plus plombée et non gris noirâtre comme chez le *S. senilis*, par les bandes roussâtres des flancs plus foncées, plus étroites et moins répandues, enfin par les ailes et la queue plus longues.

En général le *S. sylvestris* ressemble par sa coloration au *S. micropterus* (Scl.), mais il est plus petit dans toutes ses dimensions.

	Aile.	Queue.	Culmen.	Tarse.
♂ ad. de Garita	59	44½	12¾	22½ mm.
♂ juv. de Pariayacu ..	56	43	12½	23 „

293. Scytalopus acutirostris (Tsch.).

Une femelle adulte de Maraynioc (26 novembre 1891). "Iris brun foncé, bec noir, pattes d'un carné brunâtre."

Aile 51½, queue 35½, culmen 12, tarse 20¼ mm.

Cet oiseau paraît s'accorder bien avec le mâle non complètement adulte de Maraynioc décrit par Taczanowski (Orn. Pérou, i. p. 533) et comme lui possède les raies interrompues d'un brun roussâtre sur les rectrices, tandis que les oiseaux de la montaña de Nancho de la collection Raimondi ont, à ce qu'il paraît, la queue unicolore. Il nous semble douteux que les oiseaux de Nancho appartiennent réellement au *S. acutirostris*.

Notre oiseau ressemble surtout au *S. griseicollis* (Lafr.) de la Colombie, et n'en diffère que par le gris ardoisé de la gorge et de la poitrine un peu plus foncé et prolongé vers le milieu du ventre, tandis que chez le *S. griseicollis* le milieu du ventre devient blanchâtre. Les côtés du ventre, le bas-ventre, les tectrices sous-caudales et le croupion sont régulièrement rayés de brun roussâtre et de noirâtre, tandis que chez le *S. griseicollis* les flancs sont d'un roux beaucoup plus clair sans raies noirâtres et le croupion d'un brun roussâtre presque uniforme. Les rectrices chez le *S. acutirostris* sont noirâtres avec des bandes incomplètes d'un brun roussâtre au lieu d'un brun roussâtre presque uniforme ou variées de bandes noirâtres chez le *S. griseicollis*.

294. Scytalopus magellanicus (Lath.).

Un mâle adulte de Pariayacu du 27 janvier 1893.

Al. 57, caud. 40½, culm. 12¼, tars. 20¾ mm.

L'oiseau envoyé a le plumage plus schistacé, moins noirâtre que les individus du *S. magellanicus* de différentes localités que nous avons comparés. Par cette particularité il ressemble plutôt au *S. obscurus* du Chile. Il a aussi les flancs et les sus-caudales barrées de roux brun. Néanmoins il a les pieds bruns, et pourrait être un mâle du *S. magellanicus* en plumage imparfait.

2. On West-Indian Terrestrial Isopod Crustaceans.

By M. Adrien Dollfus [1].

[Received January 15, 1896.]

[The specimens described in this paper were procured by Mr. Herbert H. Smith, who in the years 1889–91 was commissioned by Mr. F. DuCane Godman, F.R.S., to collect Natural History specimens in the islands of St. Vincent and Grenada, to aid the Joint Committee of the Royal Society and the British Association in their investigation of the Fauna of the West-India Islands. The specimens are now deposited in the British Museum. In the case of one or two specimens it appears that it has unfortunately not been noticed whether they were found in St. Vincent or in Grenada.—D. S.]

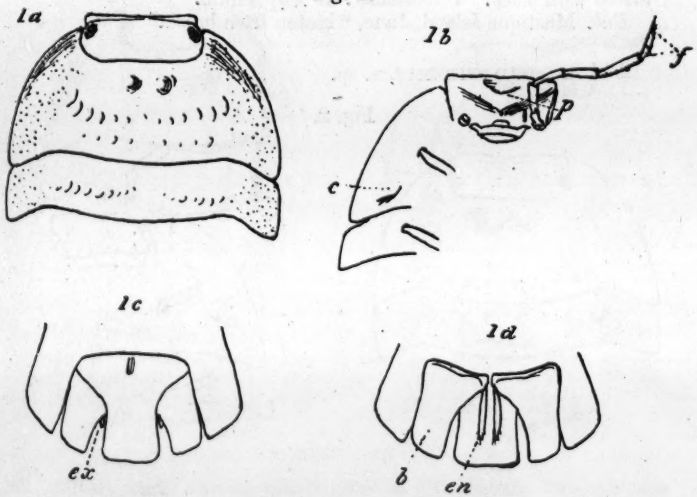
[1] Communicated by Dr. D. Sharp, F.R.S., on behalf of the Committee for investigating the Flora and Fauna of the West-India Islands.

Species of Armadilloidean Isopods seem to be numerous in the tropical regions, although they have until now generally escaped the collector's bottle. Their small size (seldom reaching to 10 millimetres in length), their dull colour, and above all the scarcity of individuals have proved a good protection. The species are remarkably localized, and none of the thirteen of which specimens are sent to me have as yet been mentioned by any of the authors who have described Isopods from Central America, the Antilles, or the neighbouring parts of South America [1], except *A. grenadensis*.

The following species are represented in the collection:—

1. ARMADILLO TENUIPUNCTATUS, n. sp.

Fig. 1.



1 *a*. Cephalon and first two segments of pereion (upperside).
1 *b*. Cephalon and first two segments of pereion (underside). *p*, prosepistoma; *f*, double-jointed flagellum of antennæ; *c*, coxopodite.
1 *c*. Fifth segment of pleon, pleotelson, uropoda (upperside). *ex*, exopodite of uropoda.
1 *d*. The same (underside). *b*, basis of uropoda; *en*, endopodite.

Body rather wide, moderately convex, slightly tuberculated on

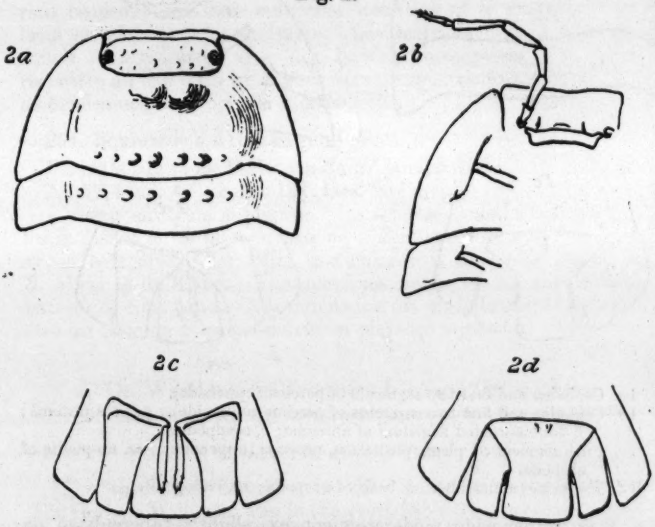
[1] For the bibliography of the terrestrial Isopods of this region consult:—
SAUSSURE (de).—Mémoire pour servir à l'Histoire naturelle du Mexique, des Antilles et des États Unis: I. Crustacés. (1858.)
MIERS.—On a Collection of Crustacea, chiefly from S. America, Proc. Zool. Soc. 1877.
BUDDE-LUND.—Crustacea Isopoda terrestria. (1885.)
Id. —Landisopoder fra Venezuela indsamlede af Dr. Fr. Meinert. (1893.)
DOLLFUS.—Voyage de M. E. Simon au Vénézuela: Isopodes terrestres. (1893.)

the pereion. Cephalon: prosepistoma with a shield-like convexity, a little depressed in the middle. Eyes middling; ocelli about 18. Antennæ short; first joint of flagellum twice as short as the second. Pereion: first segment with two antero-median rounded tubercles; lateral edges slightly raised; coxopodite hardly perceptible, as a very small processus below the leg. Second segment without a distinct coxopodite. Pleon, telson: pleotelson longer than wide, smooth, with a minute longitudinal wrinkle near the basis; sides feebly curved, the apex being half as wide as the basis. Uropoda: basis nearly straight; endopodite extending to half the length of the pleotelson; exopodite very small, placed near the middle of the internal edge of the basis (upperside). Colour: grey, with irregular light markings, the sides are light and minutely punctuated with black. Dimensions: $10 \times 4\frac{1}{2}$ millim.

Hab. Mustique Island, June, "beaten from brush."

2. ARMADILLO DEPRESSUS, n. sp.

Fig. 2.



(For lettering, see p. 389.)

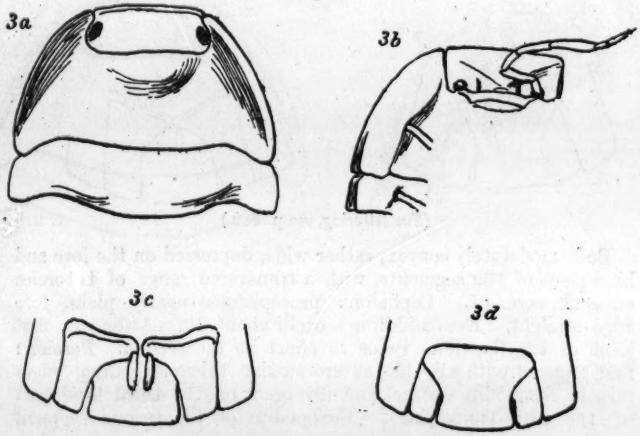
Body wide, rather depressed, granulated on cephalon and pereion. Cephalon: prosepistoma nearly plain, fore edge a little arched in the middle. Eyes middling; ocelli about 16. Antennæ: first joint of flagellum three times shorter than the second. Pereion: first segment with a wide, double, antero-median tubercle; lateral edges not raised; coxopodite hardly perceptible, as a feeble ridge. Second segment without a distinct coxopodite. Pleon, telson:

sides of the pleon depressed; processus of the fifth segment widening at the apex. Pleotelson longer than wide, smooth; sides feebly curved; apex one-third narrower than the basis. Uropoda nearly straight; endopodite extending to two-thirds the length of the pleotelson; exopodite very small, placed near the middle of the internal edge of the basis (upperside). Colour: dark grey, with a narrow light longitudinal line in the middle of the pereion, and light lineolæ on both sides. Dimensions: $9 \times 4\frac{1}{2}$ millim.

Hab. St. Vincent, Chateaubelais, August. One example.

3. ARMADILLO DUMORUM, n. sp.

Fig. 3.



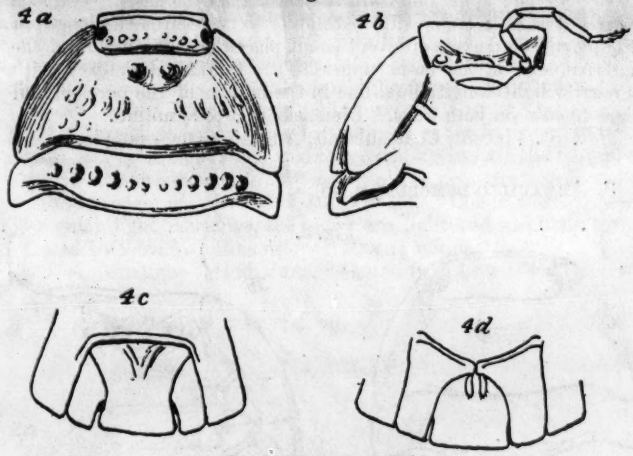
(For lettering, see p. 389.)

Body very convex, nearly smooth. Cephalon: prosepistoma nearly plain, fore edge straight. Eyes large; about 20 ocelli. Antennæ very short; first joint of flagellum twice as short as the second. Pereion: first segment with a blunt antero-median tubercle; lateral edges raised on the fore part; coxopodite separated by a cleft extending to the third hind part of the segment (underside). Second segment with a square coxopodite, distinct on its total length (underside). Pleon, telson: pleotelson quite as long as wide; sides curved; apex one-third narrower than the basis. Uropoda: basis wide, oblique; endopodite extending to one-third the length of the pleotelson; exopodite very small, placed near the middle of the internal edge of the basis (upperside). Colour: dark grey or brown, with light dots and lineolæ on both sides of the median line (pereion). Dimensions: $8 \times 3\frac{1}{2}$ millim.

Hab. Mustique Island, found by beating brush.

4. Armadillo cinctus, n. sp.

Fig. 4.



(For lettering, see p. 389.)

Body moderately convex, rather wide, depressed on the fore and hind parts of the segments, with a transverse range of tubercles on each segment. Cephalon: prosepistoma nearly plain, fore edge straight. Eyes middling; ocelli about 16. Antennæ: first joint of the flagellum twice as short as the second. Pereion: first segment with a double antero-median tubercle; lateral edges raised; coxopodite distinct and divergent on the third hind part of the edge (underside). Coxopodite of the second segment forming a narrow, quadrangular processus. Pleon, telson: pleotelson as long as wide, with a triangular tubercle near its basis; sides curved; apex one-fourth narrower than the basis. Uropoda: basis nearly straight; endopodite very small, extending hardly to one-sixth the length of the pleotelson; exopodite minute, placed above the middle of the internal edge of the basis (upperside). Colour: dark grey, with small lighter lineolæ on both sides of the median line (pereion), and three light dots on the pleotelson. Dimensions: $7\frac{1}{2} \times 3\frac{1}{4}$ millim.

Hab. Near Layon (leeward side). On rotten wood, dry forest, 500 feet, October 4.

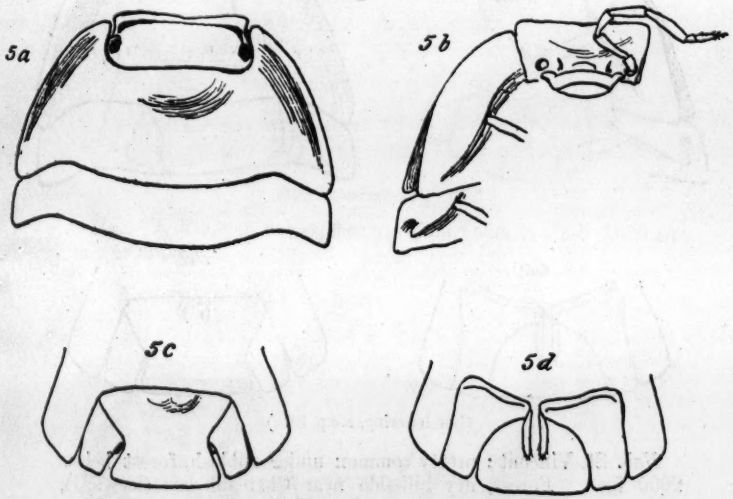
5. Armadillo grenadensis.

Armadillo grenadensis, Budde-Lund, Entomol. Meddelel. 1893, p. 115.

Body much convex, nearly smooth. Cephalon: prosepistoma slightly convex, fore edge feebly arched in the middle. Eyes rather large; ocelli about 16. Antennæ short; first joint of the

flagellum three times shorter than the second. Pereion: first segment with a blunt antero-median tubercle; lateral edges raised; coxopodite distinct and divergent on the half hind part of the edge (underside). Coxopodite of the second segment forming a tooth-like processus. Pleon, telson: pleotelson as wide as long, with a blunt double tubercle near its basis; sides curved; apex nearly as wide as the basis; endopodite reaching to two-thirds the length of the pleotelson; exopodite minute, placed near the middle of the internal edge of the basis. Colour: dark grey, with a light median line and light lineolæ on the sides; antennæ whitish. Dimensions: 14 × 6 millim.

Fig. 5.



(For lettering, see p. 389.)

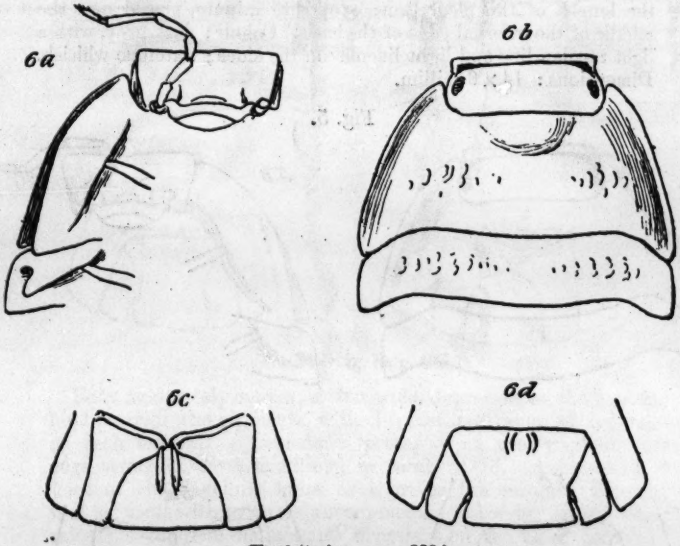
Hab. Becquia Island (June), ravine, damp ground, under rotting leaves; Grenada; Balthazar (windward), 250 feet, cocoa orchard, under rotting leaves.

6. ARMADILLO SILVARUM, n. sp.

Body convex, slightly tuberculated on the pereion. Cephalon: prosepistoma plain. Eyes large; about 20 ocelli. Pereion: first segment with a blunt, hardly perceptible antero-median tubercle; lateral edge forming a narrow raised border; coxopodite distinct on the entire length of the edge, and divergent on the half hind part. Coxopodite of the second segment forming a tooth-like, divergent processus. Pleon, telson: pleotelson wider than long, with a small, double, longitudinal ridge near the basis; sides curved near the apex; apex one-fourth narrower than the basis. Uropoda:

endopodite extending to one-half the length of the pleotelson; exopodite minute, placed near the middle of the internal edge of the basis. Colour: dark grey or brown, with three longitudinal light lines, and a wide spot on the sides of each segment; antennæ and uropoda pale. Dimensions: 16×7 millim.

Fig. 6.



(For lettering, see p. 389.)

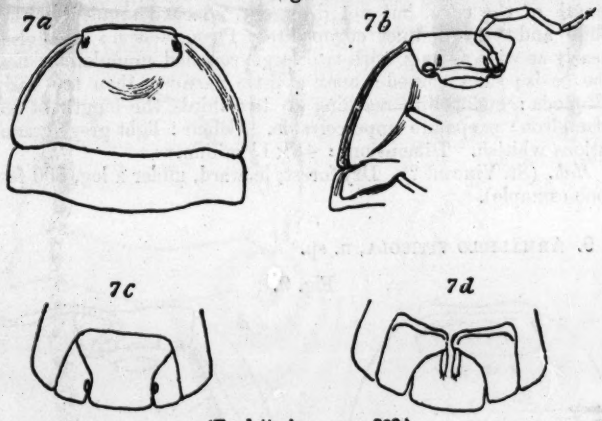
Hab. St. Vincent; pretty common under rubbish, forest below 2000 feet. Forest, dry hill-side near Chateaubelais (leeward), under stones, 1000 feet; Cumberland Valley, damp ground, 1000 feet.

7. ARMADILLO ZIGZAG, n. sp.

Body convex, smooth. Cephalon: prosepistoma plain, fore edge nearly straight. Eyes small; about 12 ocelli. Antennæ short; first joint of the flagellum twice as short as the second. Pereion: first segment with a slightly perceptible antero-median tubercle; edges hardly raised; coxopodite distinct on the entire length of the edge (underside), not divergent. Coxopodite of the second segment narrowly quadrangular. Pleon, telson: pleotelson as wide as long; sides feebly curved; apex with rounded angles, half as wide as the basis. Uropoda: basis oblique, endopodite reaching to one-half the length of the pleotelson; exopodite minute, placed near the middle of the internal edge of the basis (upperside). Colour: yellowish, with a double median and

crinkled lateral lines of dark brown; uropoda pale. Dimensions: $4 \times 1\frac{3}{4}$ millim.

Fig. 7.

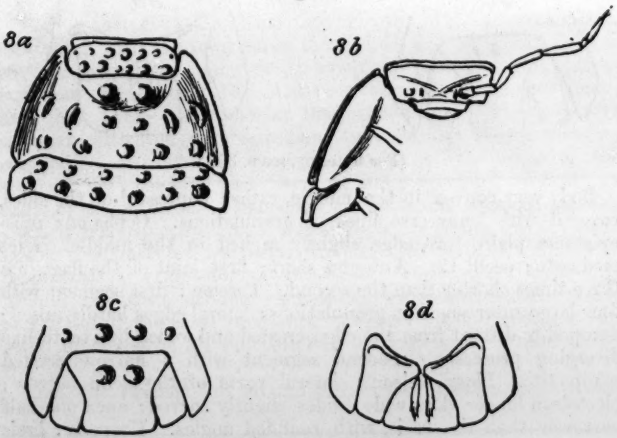


(For lettering, see p. 389.)

Hab. St. Vincent, forest, damp ground under rubbish, 1000 feet one example).

8. ARMADILLO PERLATUS, n. sp.

Fig. 8.



(For lettering, see p. 389.)

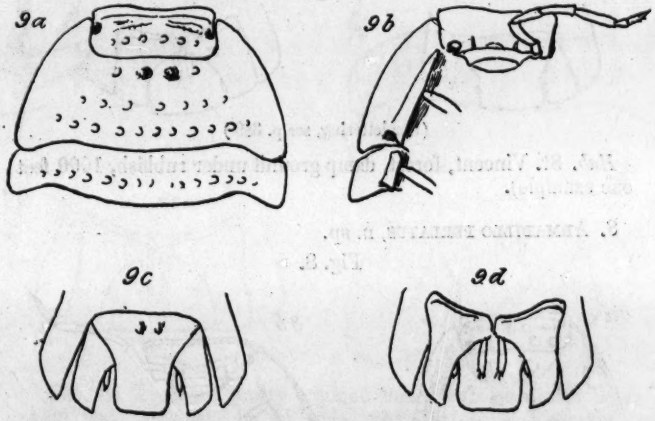
Body convex, covered with large, pearled granulations. Cephalon: prosepistoma with a shield-like convexity which does not reach quite to the front edge. Eyes very small; ocelli 3. Antennæ

short; first joint of the flagellum three times as short as the second. Pereion: first segment with two rounded antero-median granulations; lateral edges raised; coxopodite distinct on the entire length of the edge, but not divergent. Second segment with a large and very distinct coxopodite. Pleon, telson: pleotelson nearly as wide as long, with two large, rounded granulations near the basis; sides curved; apex a little narrower than the basis. Uropoda: endopodite reaching to two-thirds the length of the pleotelson; exopodite unperceivable. Colour: light grey, granulations whitish. Dimensions: $4\frac{1}{2} \times 1\frac{1}{2}$ millim.

Hab. (St. Vincent ?) Dry forest, leeward, under a log, 800 feet (one example).

9. ARMADILLO VITICOLA, n. sp.

Fig. 9.



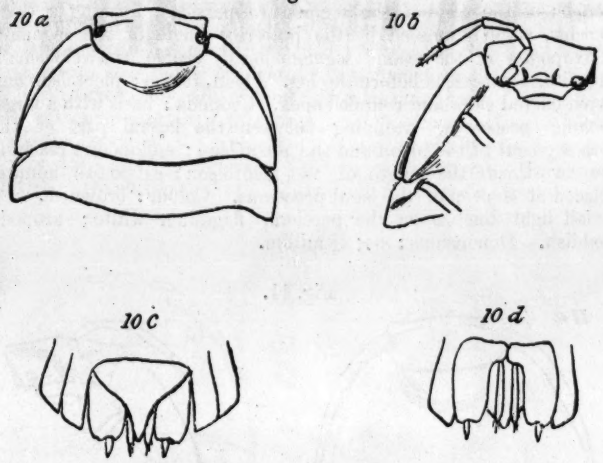
(For lettering, see p. 389.)

Body very convex in the middle, rather depressed on the sides, covered with transverse lines of granulations. Cephalon: prosepistoma plain, fore edge slightly arched in the middle. Eyes moderate; ocelli 12. Antennæ short; first joint of the flagellum three times shorter than the second. Pereion: first segment with four large antero-median granulations; lateral edges hardly raised; coxopodite distant from the edge, crested and ended by a tooth-like diverging processus. Second segment with a narrow crested coxopodite. Pleon, telson: lateral parts of the pleon narrow; pleotelson longer than wide; sides slightly curved; apex one-half narrower than the basis, with rounded angles. Uropoda: basis very oblique; endopodite reaching to one-half the length of the pleotelson; exopodite a little larger than in the former species, visible on upper and under sides. Colour: yellowish, veined and striped with brown. Dimensions: 9×4 millim.

Hab. Grenada; Balthazar (windward), second-growth woods, beaten from vines and brush, 250 feet; Chantilly (windward), hillside, edge of forest, beaten from vines and brush, 400 feet.

10. MESARMADILLO MODESTUS, n. sp.

Fig. 10.



(For lettering, see p. 389.)

Body rather convex and narrow, smooth. Prosepistoma plain, continuous with the forehead in the middle, and separated from it on both sides by a transverse, incomplete, preocular cut. Eyes moderate; ocelli about 16. Antennæ short; flagellum very small, first joint three times shorter than the second. Pereion: first segment with the antero-median tubercle hardly perceivable; coxopodites distinct on the entire length of the edge of the segment, with the hind part diverging and covered by the posterior angle of the segment. Coxopodite of the second segment forming a nearly inconspicuous ridge before the leg. Pleon, telson: pleotelson triangular; sides feebly curved; apex pointed. Uropoda: basis with a large oblong processus; endopodites extending beyond the apex of the pleotelson; exopodites small, placed at the top of the basal processus. Colour: grey or reddish, with small light lineolæ on the pereion; uropoda light. Dimensions: $6 \times 2\frac{1}{2}$ millim.

Hab. St. Vincent, low ground S.E. of the island, under rubbish.

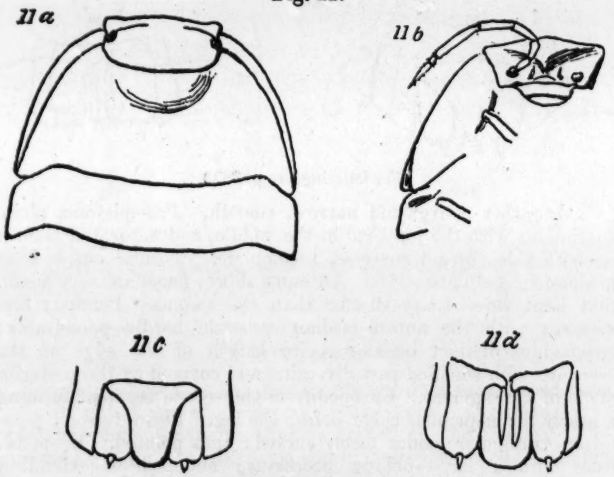
11. MESARMADILLO AMERICANUS, n. sp.[1]

Body convex, rather narrow, smooth. Cephalon: prosepistoma

[1] This genus was considered until lately to be African; its range seems wide, and extends from Madagascar to the coast of Guinea and the Antilles. No Asiatic species has yet been mentioned.

with a small shield-like convexity; the prosepistoma is continuous with the forehead in the middle and separated from it on both sides by a transverse, incomplete, preocular cut. Eyes moderate; ocelli about 12. Antennæ short; flagellum small, first joint three times shorter than the second. Pereion: first segment with the antero-median tubercle hardly perceivable; coxopodites distinct on the entire length of the edge of the segment (upperside), forming a thick border, slightly crossed by the posterior angle of the segment. Coxopodite of the second segment hardly visible as a very small, dentiform processus before the leg. Pleon, telson: pleotelson flat, with curved sides and rounded apex. Uropoda: basis with a large, oblong processus, extending between the lateral part of the 5th segment of the pleon and the pleotelson; endopodite reaching to two-thirds the length of the pleotelson; exopodite minute, placed at the top of the basal processus. Colour: brownish, with small light lineolæ on the pereion; flagellum white; uropoda reddish. Dimensions: $6 \times 2\frac{1}{4}$ millim.

Fig. 11.



(For lettering, see p. 389.)

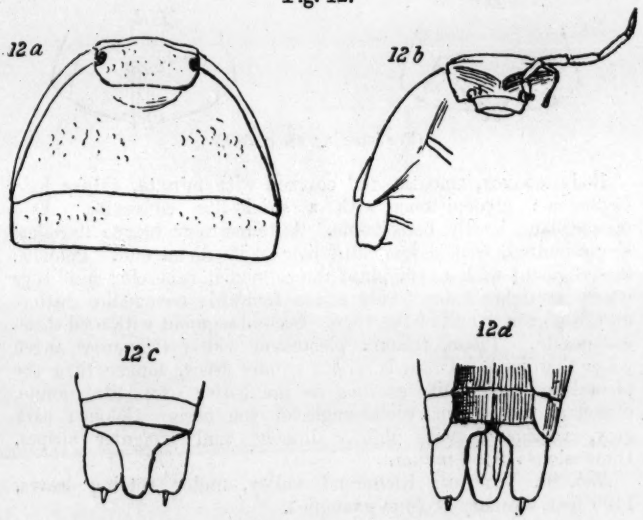
Hab. St. Vincent, sugar-cane field, under decaying cane-leaves, March. Leeward, lowland near sea, under stones, May; under old boards, 250 feet, September; under rubbish, shady place, 500 feet.

12. MESARMADILLO REFLEXUS, n. sp.

Body slightly granulated, very convex, and narrowed backward, the side parts of the pereion (segments 2–7) and of the pleon bending downwards. Cephalon: prosepistoma with a shield-like

triangular convexity; the prosepistoma is continuous with the forehead in the middle and separated from it on both sides by a transverse, incomplete, præocular cut. Eyes moderate; ocelli about 12. Antennæ short; flagellum small, first joint four times shorter than the second. Pereion: first segment with the antero-median tubercle hardly perceivable; coxopodites distinct on the entire length of the edge of the segment. Coxopodite of the second segment hidden under the bent side part of the segment. Pleon, telson: the lateral parts being nearly folded underneath, the hind edge of segments 3–5 seems straight from a dorsal view. Pleotelson flat, with curved sides and a blunt, rather rounded apex. Uropoda: basis with a large oblong processus; endopodite reaching to two-thirds the length of the pleotelson; exopodite small, placed at the top of the basal processus. Colour: dark brown, flagellum whitish. Dimensions: 5 × 2 millim. (much decreasing backward).

Fig. 12.



(For lettering, see p. 389.)

Hab. Open swampy land, under rubbish, S. end of the Island (St. Vincent?), September 27.

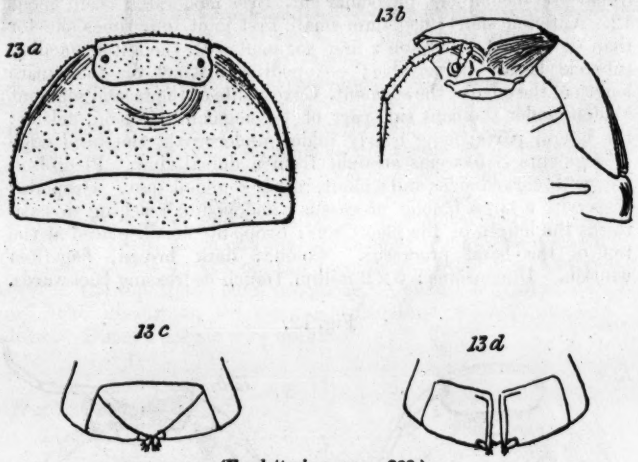
HAPLARMADILLO, gen. nov.

Very much like *Synarmadillo*, Dollfus[1]. It differs from this African genus in its monocellated eyes, and in the flagellum being single-jointed (this is quite an exception in Armadillos).

[1] A. Dollfus, "Voyage de M. Alluaud dans le territoire d'Assinie: Crustacés Isopodes terrestres," Ann. Soc. Ent. Fr. 1892, pp. 388–389, pl. 7. fig. 4.

13. HAPLARMADILLO MONOCELLATUS, n. sp.

Fig. 13.



(For lettering, see p. 389.)

Body convex, smooth, and covered with minute, setose hair. Cephalon: prosepistoma with a shield-like convexity. Eyes monocellate, hardly perceivable. Antennæ very hairy; flagellum single-jointed, with a long stiff hair at its distal end. Pereion: first segment with a very blunt antero-median tubercle; hind edge nearly straight; sides feebly raised forward; coxopodite distinct on the posterior half of the edge. Second segment with no distinct coxopodite. Pleon, telson: pleotelson widely triangular, much wider than long. Uropoda with a square basis, longer than the pleotelson; endopodite as long as the basis; exopodite minute, placed at the internal distal angle of the basis. Colour: dark grey, variegated with lighter lineolæ and irregular stripes. Dimensions: 9 × 4 millim.

Hab. St. Vincent; Richmond valley, under rotting leaves, 1100 feet, January 18 (one example).

March 17, 1896.

Prof. G. B. HOWES, F.Z.S., in the Chair.

Mr. Sclater called the attention of the Meeting to the prospectus of the new work 'Das Tierreich,' to be published by Friedländer and Son, of Berlin, of which he had spoken in addressing the Society on the subject of Nomenclature at the last Meeting. The prospectus showed that a considerable number of zoologists were

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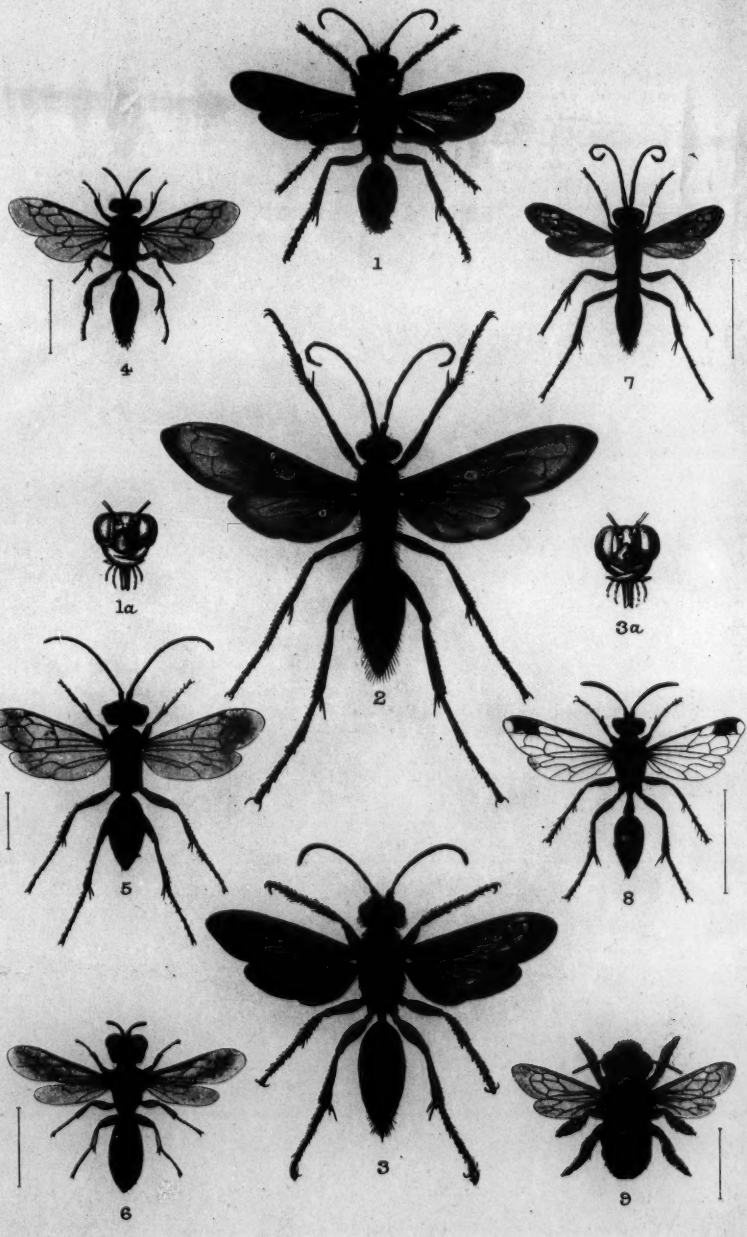

Horace Knight ad nat. lith. West, Newman chromo.

Ceylonese Hymenoptera.

already at work on this important undertaking of the Deutsche Zoologische Gesellschaft, under the general editorship of Prof. F. E. Schulze, of Berlin. The first part of the work was promised to be ready in the beginning of 1897, and twenty-five years were allowed for its full completion. The general character of the work was shown by the pattern treatise on the Heliozoa prepared by Dr. Fritz Schaudinn, which accompanied the prospectus. In this treatise of 24 pages about 60 species were described, so that if this ratio of species to pages was an average one it would seem that upwards of 190 volumes would be required to complete the work.

In reference to the discussion on Zoological Nomenclature, which took place at the last Meeting, Mr. Sclater remarked that he had omitted to state that at the late International Congress of Zoology held at Leyden (see Bull. trois. Congr. Int. de Zoologie, no. 5, p. 6) a committee of five Naturalists of different countries had been appointed with the object of endeavouring to settle the differences between the several codes of Zoological Nomenclature. The names suggested on that occasion by Prof. F. E. Schulze, and accepted by the Meeting, were Prof. Blanchard of Paris, Prof. Victor Carus of Leipzig, Dr. Jentink of Leyden, Mr. Sclater, and Dr. W. Stiles of Washington. This subject would therefore come very appropriately before the next International Zoological Congress, which was proposed to be held in this country in 1898.

The following papers were read:—

1. A Contribution to the Knowledge of the Hymenopterous Fauna of Ceylon. By Lt.-Col. C. T. Bingham, F.Z.S., F.E.S.

[Received February 17, 1896.]

(Plate XV.)

I know of only two published lists dealing with the Hymenoptera of Ceylon. The first, by Walker, is given in chapter xii. of Tennent's 'Natural History of Ceylon,' and includes Walker's new species described in the 'Annals and Magazine of Natural History,' series 3, vols. iv. (1859) and v. (1860). The second list, by Motschoulsky, appeared in the 'Bulletin de la Société Impériale des Naturalistes,' Moscow, 1863. In this Walker's list was republished, and several new species, chiefly *Chalcididæ* and *Ichneumonidæ*, were described.

The present paper, founded on the collections made in Ceylon by Col. Yerbury, R.A., and Mr. E. E. Green, deals only with the Aculeate, or more correctly, seeing that I have included the Tubulifera (*Chrysididæ*), the Monotrochous Hymenoptera found in

the island. Three hundred and forty-one species, of which seven have not previously been described, are here recorded, a number, however, far less than what must actually occur in an island with so varied a climate and flora as Ceylon.

The species, as was to be expected, are chiefly Indian, but I have thought it premature to enter into any detailed comparison of the fauna with that of any other portion of the Oriental region, more especially as, since the publication, nearly thirty years ago, by the late Mr. Smith of his 'Catalogue of the Aculeate Hymenoptera and *Ichneumonidæ* of India and the Eastern Archipelago,' no comprehensive list of the hymenopterous insects of India has appeared.

I have to add, by way of explanation, that, in the following list, where no locality is mentioned the insect does not occur in either Colonel Yerbury's or Mr. Green's collections, and has simply been recorded or described from Ceylon, with no particular locality indicated.

Family Formicidæ, Leach.

Genus Camponotus, Mayr.

1. Camponotus sericeus (Fabricius).

Formica sericea, Fabr. Ent. Syst. Suppl. 279, 9; Lepel. Hym. i. 217, 24; Smith, Cat. Hym. Ins. B. M. vi. 31, 103; Jour. Linn. Soc. xi. (1867), 306, 54.

Formica aurulenta, Latr. Hist. Nat. Fourm. 114, pl. 3, f. 9 ☿.

Lasius sericeus, Fabr. Syst. Piez. 416, 4.

Formica cinerascens, Jerd. (nec Fabr.) Madr. Jour. Lit. & Sci. 1851, 123.

Formica obtusa, Smith, Cat. Hym. Ins. B. M. vi. 30, 99.

Camponotus sericeus, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 675, 39; Forel, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 231, 1; Emery, Ann. Soc. Ent. Fr. 1893, 254, 161.

Camponotus opaciventris, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1878, 648 ☿ (var.).

Trincomalee.

2. Camponotus varians, Roger.

Camponotus varians, Roger, Berl. ent. Zeitschr. 1863, p. 138, 10 ☿; Forel, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 232, 2.

3. Camponotus reticulatus, Roger.

Camponotus reticulatus, Roger, Berl. ent. Zeitschr. 1863, 139, 11; Forel, Jour. Bombay, Nat. Hist. Soc. vii. (1892), 233, 7, & 431 7, var.

Formica reticulata, Smith, Jour. Linn. Soc. xi. (1867), 307, 61.

Besides a variety of this species (*C. latitans*), Forel has described (*l. c.* p. 431) a new race as *Camponotus yerburyi*.

Kandy (*Yerbury coll.*).

4. Camponotus barbatus, Roger.

Camponotus barbatus, Roger, Berl. ent. Zeitschr. 1863, 138, 9 ☿ ; Forel, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 233, 8.

Formica barbata, Smith, Jour. Linn. Soc. xi. (1867), 306, 59.

5. Camponotus dorycus (Smith).

Formicus dorycus, Smith, Jour. Linn. Soc. v. (1861), 96, 11 ☿; id. xi. (1867), 308, 85.

Camponotus sesquipedalis, Roger, Berl. ent. Zeitschr. 1863, 137, 7 ☿.

Camponotus dorycus, Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 32, 12; Forel, idem, 236, 13 (race *C. carin*, Emery, Ann. d. Mus. Civ. di Stor. Nat. Genova, ser. 2, vii. (1889), 512, 74).

6. Camponotus rufoglaucus (Jerdon).

Formica pubescens, Brullé (nec Fabr.), Hist. Nat. Il. Canar. ii. 84, 1.

Formica rufoglauca, Jerd. Madr. Jour. Lit. & Sci. 1851, 124; Smith, Cat. Hym. Ins. B. M. vi. 16, 53; Jour. Linn. Soc. xi. (1867), 303, 11.

Formica (*Camponotus*) *micans*, Nyl. Ann. Sci. Nat. v. (1856), 55, 4 ☿; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. 1892, 33, 16.

Camponotus flavo-marginatus, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 664, 17 ☿ (var.).

Camponotus redtenbacheri, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 667, 25 ☿ (var.).

Camponotus rufoglaucus, Forel, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 237, 15; Emery, Ann. Soc. Ent. Fr. 1893, 252, 57.

Heneratagoda (*Yerbury coll.*).

7. Camponotus angusticollis (Jerdon).

Formica angusticollis, Jerd. Madr. Jour. Lit. & Sci. 1851, 120.

Formica gigas, Smith (nec Latr.), Cat. Hym. Ins. B. M. vi. 14, 45.

Formica ardens, Smith, Cat. Hym. Ins. B. M. vi. 17, 62 ☿.

Formica impetuosa, Smith, Cat. Hym. Ins. B. M. vi. 18, 63.

Camponotus prismaticus, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 669, 30 ☿.

Camponotus angusticollis, Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. 32, 10; Forel, idem, 235, 12; Emery, Ann. Soc. Ent. Fr. 1893, 250, 51.

Hinaduma (*Yerbury coll.*).

8. Camponotus simoni, Emery.

Camponotus simoni, Emery, Ann. Soc. Ent. Fr. 1893, 250, 51 ☿.

Cottawa.

9. Camponotus albipes, Emery.

Camponotus albipes, Emery, Ann. Soc. Ent. Fr. 1893, 253, 60 ☿.

Kandy.

10. Camponotus maculatus (Fabricius).

Formica maculata, Fabr. Spec. Ins. i. 491, 15; Ent. Syst. ii. 356, 25; Syst. Piez. 403, 29; Oliv. Encycl. Méth. vi. 495, 22; Latr. Hist. Nat. Fourm. 283; Lepel. Hym. i. 215, 19; Smith, Cat. Hym. Ins. B. M. vi. 28, 96.

Formica cognata, Smith, Cat. Hym. Ins. B. M. vi. 35, 117.

Camponotus maculatus, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 654, 1; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 30–32; Forel, idem, 240, 21; Emery, Ann. Soc. Ent. Fr. 1893, 251, 53.

Forel includes under the above, which is typically an African species, a group of races of which the following have been recorded from Ceylon:—

a. Camponotus compressus (Fabricius).

Formica compressa, Fabr. Mant. Ins. i. 307, 2 ☿; Ent. Syst. ii. 350, 2; Syst. Piez. 396, 2; Oliv. Encycl. Méth. vi. 491; Latr. Hist. Nat. Fourm. 111; Lepel. Hym. i. 214, 17; Smith, Cat. Hym. Ins. B. M. vi. 13, 44 ♀ ♂; Jour. Linn. Soc. xi. (1867), 303, 3.

Formica indefessa, Sykes, Trans. Ent. Soc. i. (1836), 104, pl. 13. f. 6.

Formica callida, Smith, Cat. Hym. Ins. B. M. vi. 18, 64; Jour. Linn. Soc. xi. (1867), 304, 19.

Camponotus quadrilaterus, Roger, Berl. ent. Zeitschr. 1863, 136, 6 ☿.

Camponotus compressus, Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 30, 1; Forel, idem, 240.

Trincomalee (*Yerbury coll.*).

b. Camponotus taylori, Forel.

Camponotus taylori, Forel, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 241.

Nuwara Eliya (*Yerbury coll.*).

c. Camponotus infuscus, Forel.

Camponotus infuscus, Forel, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 242; Emery, Ann. Soc. Ent. Fr. 1893, 252, 56.

Nuwara Eliya.

d. Camponotus mitis (Smith).

Formica mitis, Smith, Cat. Hym. Ins. B. M. vi. 20, 69 ☿; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. des Nat. Mosc. 1863, 11; Smith, Jour. Linn. Soc. xi. (1867), 304, 24.

Formica timida, Jerd. (nec Forst.), Madr. Jour. Lit. & Sci. 1851, 122.

Formica variegata, Smith, Cat. Hym. Ins. B. M. vi. 19, 68 ☿.

Formica ventralis, Smith, Cat. Hym. Ins. B. M. vi. 20, 70.

Camponotus agnatus, Roger, Berl. ent. Zeitschr. 1863, 137, 8 ☿.

Camponotus mitis, Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 31, 3; Forel, idem, 242; Emery, Ann. Soc. Ent. Fr. 1893, 252, 54 & 55.

Trincomalee, Huldamulla (*Yerbury coll.*).

Forel notes four varieties of *C. mitis* from Ceylon:—

C. mitis, Smith (sens. str.).

C. bacchus, Smith, Cat. Hym. Ins. B. M. vi. 21, 71.

C. fuscithorax, Forel, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 230; Emery, Ann. Soc. Ent. Fr. 1893, 252, 54.

C. dulcis, Emery, Ann. d. Mus. Civ. di Stor. Nat. Genova, ser. 2, vii. (1889), 511, 72.

e. CAMPONOTUS THRASO, Forel.

Camponotus thraso, Forel, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 432.

Trincomalee (*Yerbury coll.*).

The following species, somewhat insufficiently described by Walker in the 'Annals and Magazine of Natural History,' 3rd series, vol. iv. (1859), pp. 370–375, and by Motschoulsky in the 'Bulletin de la Société Impériale des Naturalistes,' Moscow, 1863, pp. 11–14, are not noticed by either Forel or Emery:—

11. FORMICA LATEBROSA, Walker, l. c. p. 371.
12. „ PANGENS, „ „ 371.
13. „ DETORQUENS, „ „ 372.
14. „ DIFFIDENS, „ „ 372.
15. „ CONSULTANS, „ „ 373.
16. „ INDEFLEXA, „ „ 373.
17. „ PYRRHOCEPHALA, Motsch. l. c. p. 11.
18. „ FUSCICAUDA, „ „ 12.
19. „ SUBPICEA, „ „ 12.

Genus POLYRACHIS, Schuckard.

20. POLYRACHIS SCISSA (Roger).

Hemioptica scissa, Roger, Berl. ent. Zeitschr. 1862, 240, pl. 1. f. 12 ♀ ☿; Smith, Jour. Linn. Soc. xi. (1867), 318, 1; Emery, Ann. Soc. Ent. Fr. 1893, 255, 70.

Polyrachis scissa, Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 27, 1 ♂.

Hinaduma (*Yerbury coll.*).

21. POLYRACHIS ACULEATA, Mayr.

Polyrachis aculeata, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1878, 657 ♀ ; Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 28, 2 ♀ ♂.

Trincomalee (*Yerbury coll.*).

22. POLYRACHIS ARGENTEA, Mayr.

Polyrachis argenteus, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 682, 9 ☿ ; Smith, Jour. Linn. Soc. xi. (1867), 317, 113.

Polyrachis argentea, Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 37, 29 ; Emery, Ann. Soc. Ent. Fr. 1893, 254, 66 ♀ ; Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 34, 43 ♀ ♂.

Kandy.

23. POLYRACHIS JERDONII, Forel.

Polyrachis jerdonii, Forel, Neujahrsblatt der naturf. Ges. Zurich, 1893, 17 (footnote) ; Jour. Bomb. Nat. Hist. Soc. viii. (1893), 28, 4 ♀.

Trincomalee (*Yerbury coll.*).

24. POLYRACHIS FRAUENFELDI, Mayr.

Polyrachis frauenfeldi, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 687, 22 ☿ ; Smith, Jour. Linn. Soc. xi. (1867), 317, 120 ; Forel, Jour. Bombay Nat. Hist. Soc. viii. (1893), 28, 7.

25. POLYRACHIS THRINAX, Roger.

Polyrachis thrinax, Roger, Berl. ent. Zeitschr. 1863, 152, 29 ☿ ; Smith, Jour. Linn. Soc. xi. (1867), 316, 105 ; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 39, 35 ; Forel, idem, viii. (1893), 28, 9 ♀ ♂ ; Emery, Ann. Soc. Ent. Fr. 1893, 254, 63.

Hinarub Goda (*Yerbury coll.*).

26. POLYRACHIS CLYPEATA, Mayr.

Polyrachis clypeatus, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 683, 12 ♀ ; Smith, Jour. Linn. Soc. xi. (1867), 317, 114.

Polyrachis clypeata. Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 29, 11 ; Emery, Ann. Soc. Ent. Fr. 1893, 254, 62.

Colombo, Kandy.

27. POLYRACHIS PUNCTILLATA, Roger.

Polyrachis punctillata, Roger, Berl. ent. Zeitschr. 1863, 152, 30 ☿ ♀ ; Smith, Jour. Linn. Soc. xi. (1867), 316, 106 ; Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 29, 12.

28. POLYRACHIS CONVEXA, Roger.

Polyrachis convexa, Roger, Berl. ent. Zeitschr. 1863, 153, 31 ☿ ; Smith, Jour. Linn. Soc. xi. (1867), 317, 107 ; Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 29, 14.

29. POLYRACHIS MAYRI, Roger.

Polyrachis relucens, Mayr (nec Latr.), Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 685, 17.

Polyrachis mayri, Roger, Berl. ent. Zeitschr. 1863, 198, 7; Smith, Jour. Linn. Soc. xi. (1867), 318, 123; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 39, 37; Forel, idem, viii. (1893), 29, 17; Emery, Ann. Soc. Ent. Fr. 1893, 255, 69.

Kanthalai (*Yerbury coll.*).

30. POLYRACHIS YERBURYI, Forel.

Polyrachis yerburyi, Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 29 ☿ ♀.

Kandy (*Yerbury coll.*).

31. POLYRACHIS RASTELLATA (Latreille).

Formica rastellata, Latr. Hist. Nat. Fourm. 130 ♀.

Polyrachis rastellata, Smith, Cat. Hym. Ins. B. M. vi. 59, 5; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 36, 23; Forel, idem, viii. (1893), 30, 21; Emery, Ann. Soc. Ent. Fr. 1893, 254, 64.

Polyrachis busiris, Smith, Jour. Linn. Soc. v. (1861), 98, 7 ☿, pl. i. f. 15; Jour. Linn. Soc. xi. (1867), 315, 82.

Polyrachis rastellatus, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 688, 23; Smith, Jour. Linn. Soc. xi. (1867), 310, 5.

Polyrachis euryalus, Smith, Jour. Linn. Soc. xi. (1863), 16, 24 ♀; idem, xi. (1867), 316, 99.

Periyakulam (*Yerbury coll.*).

32. POLYRACHIS YPSILON, Emery.

Polyrachis ypsilon, Emery, Ann. d. Mus. Civ. di Stor. Nat. Genova, ser. 2, iv. (1887), 239, 72; Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 31, 24.

33. POLYRACHIS HIPPOMANES, Smith.

Polyrachis hippomanes, Smith, Jour. Linn. Soc. vi. (1862), 43, 21 ☿, pl. i. f. 20; id. xi. (1867), 315, 76; Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 31, 26; Emery, Ann. Soc. Ent. Fr. 1893, 254, 67.

Kandy, Cottawa.

The subspecies found in Ceylon is *P. ceylonensis*, Emery.

34. POLYRACHIS ŒDIPUS, Forel.

Polyrachis œdipus, Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 31, 29 ☿; Emery, Ann. Soc. Ent. Fr. 1893, 255, 68.

Kandy (*Yerbury coll.*).

35. POLYRACHIS RUFICAPRA, Roger.

Polyrachis ruficapra, Roger, Berl. ent. Zeitschr. 1863, 154,

32 ☿ ♀ ; Smith, Jour. Linn. Soc. xi. (1867), 317, 109; Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 33, 36.

36. POLYRACHIS SIMPLEX, Mayr.

Polyrachis simplex, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 682, 11 ♀ ; Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 34, 39 ♀.

Polyrachis spiniger, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1878, 653 ☿ ♂.

Polyrachis spinigera, Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 37, 30 ; Emery, Ann. Soc. Ent. Fr. 1893, 254, 65.

Trincomalee (*Yerbury coll.*); Kandy.

37. POLYRACHIS DIVES, Smith.

Polyrachis dives, Smith, Cat. Hym. Ins. B. M. vi. 68, 10 ☿, pl. iv. f. 32, 33 ; Mayr. Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 682, 10; Smith, Jour. Linn. Soc. xi. (1867), 311, 10; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 36, 28 ; Forel, idem, viii. (1893), 34, 41.

Hot wells, Kandy (*Yerbury coll.*).

38. POLYRACHIS EXERCITA (Walker).

Formica exercita, Walk. Ann. & Mag. Nat. Hist. ser. 3, iv. (1859), 370.

Polyrachis exercita, Smith, Jour. Linn. Soc. xi. (1867), 318, 125.

39. POLYRACHIS ILLAUDATUS, Walker.

Polyrachis illaudatus, Walk. Ann. & Mag. Nat. Hist. ser. 3, iv. (1859), 373 ; Smith, Jour. Linn. Soc. xi. (1867), 318, 124.

40. POLYRACHIS NIGER, Mayr.

Polyrachis niger, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 683, 13 ♀ ; Smith, Jour. Linn. Soc. xi. (1867), 317, 115.

Genus ŒCOPHYLLA, Smith.

41. ŒCOPHYLLA SMARAGDINA (Fabricius).

Formica smaragdina, Fabr. Spec. Ins. i. 488, 2 ♀ ; Mant. i. 307, 3; Ent. Syst. ii. 350, 3 ; Syst. Piez. 397, 4 ; Latr. Hist. Nat. Fourm. 176, pl. iii. f. 18 ; Lepel. Hym. i. 218, 25 ; Smith, Cat. Hym. Ins. B. M. vi. 17, 61 ; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454.

Formica virescens, Fabr. Syst. Ent. 392, 9 ☿ ; Spec. Ins. i. 490, 13 ; Mant. Ins. i. 308, 16 ; Ent. Syst. ii. 355, 23 ; Smith, Cat. Hym. Ins. B. M. vi. 29, 97, pl. iii. 24–27.

Formica longinoda, Latr. Hist. Nat. Fourm. 184 ☿.

Lasius virescens, Fabr. Syst. Piez. 417, 8.

Formica macra, Guér. Voy. Coq., Zool. ii. 202, Atlas, t. 8. ff. 1, 1 *a*, 1 *b*.

Formica zonata, Guér. Voy. Coq., Zool. ii. 205 ♀.

Formica viridis, Kirby, Trans. Linn. Soc. xii. 477 ♀.

Œcophylla smaragdina, Smith, Jour. Linn. Soc. v. (1861), 102, 1; Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 695, 1; Smith, Jour. Linn. Soc. xi. (1867), 319, 1; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 39, 41; Forel, idem, viii. (1893), 400; Emery, Ann. Soc. Ent. Fr. 1893, 250.

Œcophylla virescens, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 695, 2.

Trincomalee (*Yerbury coll.*); Pundaloya (*Green coll.*); Kandy; Colombo; Nawalapitiya.

Fabricius's 'Systema Entomologiæ, sistens Insectorum Classes, Ordines, Genera, Species etc.,' in which the name "*virescens*" for the African species is published, bears date 1775; his 'Species Insectorum,' in which the Asiatic species is described as "*smaragdina*," is dated 1781, so that as the African and Asiatic species are now considered identical, the name "*virescens*" has priority; but as our Indian red ant is so well known under the name "*smaragdina*," it has been considered, apparently by both Forel and Emery, not advisable to change the specific denomination.

Genus Prenolepis, Mayr.

42. Prenolepis longicornis (Latreille).

Formica longicornis, Latr. Hist. Nat. Fourm. 113 ☿; Smith, Cat. Hym. Ins. B. M. vi. 31, 104.

Formica vagans, Jerd. Madr. Jour. Lit. & Sci. 1851, 124 ♀ ☿; Ann. & Mag. Nat. Hist. ser. 2, xiii. (1854), 106, 39; Smith, Cat. Hym. Ins. B. M. vi. 17, 59; Jour. Linn. Soc. xi. (1867), 303, 15.

Formica gracilescens, Nyl. Ann. Sci. Nat. v. (1856), 73.

Tapinoma gracilescens, Smith, Cat. Hym. Ins. B. M. vi. 56, 4.

Paratrechina vagabunda, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 13; Smith, Jour. Linn. Soc. xi. (1867), 309.

Prenolepis gracilescens, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 698, 4 (Novara Exp. Ceylon).

Prenolepis longicornis, Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 408, 1 ☿ ♂; Emery, Ann. Soc. Ent. Fr. 1893, 250, 49.

Trincomalee (*Yerbury coll.*); Galle; Colombo.

43. Prenolepis yerburyi, Forel.

Prenolepis yerburyi, Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 409, 3 ♀ ☿; Emery, Ann. Soc. Ent. Fr. 1893, 250, 50.

Nuwara Eliya (*Yerbury coll.*).

44. Prenolepis indica, Forel.

Prenolepis indica, Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 409, 4 ♀ ♂.

Trincomalee (*Yerbury coll.*).

Genus Acantholepis, Mayr.

45. Acantholepis capensis, Mayr.

Acantholepis capensis, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 699, 1 ☿; Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 414, 2.

46. Acantholepis lunaris, Emery.

Acantholepis lunaris, Emery, Ann. Soc. Ent. Fr. 1893, 250, 47 ☿.
Colombo.

Genus Plagiolepis, Mayr.

47. Plagiolepis longipes (Jerdon).

Formica longipes, Jerd. Madr. Jour. Lit. & Sci. 1851, 122; Smith, Cat. Hym. Ins. B. M. vi. 19, 67; Jour. Linn. Soc. xi. 1867, 304, 22.
Formica trifasciata, Smith, Cat. Hym. Ins. B. M. vi. 27, 92 ♀; Jour. Linn. Soc. xi. (1867), 306, 46.
Prenolepis gracilipes, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 698, 5.
Plagiolepis longipes, Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 415, 1; Emery, Ann. Soc. Ent. Fr. 1893, 250, 46.
Kandy; Galle; Matalle.

48. Plagiolepis pissina, Roger.

Plagiolepis pissina, Roger, Berl. ent. Zeitschr. 1863, 162, 45 ☿; Smith, Jour. Linn. Soc. xi. (1867), 318, 1; Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 417, 5.

Genus Acropyga, Roger.

49. Acropyga acutiventris, Roger.

Acropyga acutiventris, Roger, Berl. ent. Zeitschr. 1863, 243 ♀ ☿; Smith, Jour. Linn. Soc. xi. (1867), 319, 1; Forel, Jour. Bomb. Nat. Hist. Soc. viii. (1893), 418.
Plagiolepis flava, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 699, 1 ♀ ♂.
Anavadhupur (*Yerbury coll.*).

Genus Aneuretus, Emery.

50. Aneuretus simoni, Emery.

Aneuretus simoni, Emery, Ann. Soc. Ent. Fr. 1893, 242, 4 ☿; Forel, Jour. Bomb. Nat. Hist. Soc. ix. (1894), 462 ☿.

Genus Dolichoderus, Sund.

51. Dolichoderus taprobanæ (Smith).

Formica taprobanæ, Smith, Cat. Hym. Ins. B. M. vi. 13, 43 ♀;

Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. 1863, 11; Smith, Jour. Linn. Soc. xi. (1867), 303, 2, *Hypoclinea gracilipes*, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, (1879), 658 ☿.

Dolichoderus taprobanæ, Forel, Jour. Bomb. Nat. Hist. Soc. ix. (1894), 466, 8.

Trincomalee (*Yerbury coll.*).

52. Dolichoderus gracilis (Motschoulsky).

Hypoclinea gracilis, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 14 ☿.

Dolichoderus gracilis, Emery, Ann. Soc. Ent. Fr. 1893, 249, 42.

Genus Technomyrmex, Mayr.

53. Technomyrmex albipes (Smith).

Tapinoma albipes, Smith, Jour. Linn. Soc. vi. (1862), 38, 9 ☿; id. xi. (1867), 310, 6.

Tapinoma albitarse, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 14; Smith, Jour. Linn. Soc. xi. (1867), 310, 7.

Tapinoma nigrum, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 703, 1 ☿.

Technomyrmex albipes, Emery, Ann. Soc. Ent. Fr. 1893, 249, 44; Forel, Jour. Bomb. Nat. Hist. Soc. ix. (1894), 466, 1 ☿.

Trincomalee (*Yerbury coll.*).

54. Technomyrmex bicolor, Emery.

Technomyrmex bicolor, Emery, Ann. Soc. Ent. Fr. 1893, 249, 45 ☿; Forel, Jour. Bomb. Nat. Hist. Soc. ix. (1894), 467.

Genus Iridomyrmex, Mayr.

55. Iridomyrmex anceps (Roger).

Formica anceps, Roger, Berl. ent. Zeitschr. 1863, 164, 50 ☿; Smith, Jour. Linn. Soc. xi. (1867), 307, 64.

Iridomyrmex anceps, Forel, Jour. Bomb. Nat. Hist. Soc. ix. (1894), 469, 4.

Genus Bothriomyrmex, Emery.

56. Bothriomyrmex wroughtonii, Forel.

Bothriomyrmex wroughtonii, Forel, Jour. Bomb. Nat. Hist. Soc. ix. (1894), 470, 1 ☿ ♀ ♂.

Trincomalee (*Yerbury coll.*).

Genus Tapinoma, Foerst.

57. Tapinoma melanocephalum (Fabricius).

Formica melanocephala, Fabr. Ent. Syst. ii. 353, 13; Latr. Hist. Nat. Fourm. 269; Smith, Cat. Hym. Ins. B. M. vi. 46, 152.

Formica nana, Jerd. (nec Smith), Madr. Jour. Lit. & Sci. (1851), 125; Ann. & Mag. Nat. Hist. ser. 2, xiii. (1854), 108, 44; Smith, Cat. Hym. Ins. B. M. vi. 15, 52; Jour. Linn. Soc. xi. (1867), 303, 10.

Myrmica pellucida, Smith, Cat. Hym. Ins. B. M. vi. 124, 41 ☿; Jour. Linn. Soc. xi. (1867), 324, 2.

Formica familiaris, Smith, Jour. Linn. Soc. v. (1861), 68, 4 ♀; id. xi. (1867), 307, 76.

Tapinoma melanocephalum, Emery, Ann. Soc. Ent. Fr. 1893, 249, 43; Forel, Jour. Bomb. Nat. Hist. Soc. ix. (1894), 472, 1.

Trincomalee (*Yerbury coll.*).

The following species recorded from Ceylon has not as yet been noticed by Forel (*loc. cit.*):—

58. Tapinoma? (Formica?) obscurans, Walk. Ann. & Mag. Nat. Hist. ser. 3, iv. (1859), 372.

Genus Odontomachus, Latreille.

59. Odontomachus hæmatodes (Linnæus).

Formica hæmatodes, Linn. Syst. Nat. i. 965, 17 ☿; Fabr. Ent. Syst. ii. 364, 29; Latr. Hist. Nat. Fourm. 192.

Formica maxillosa, De Geer, Ins. iii. 601, pl. 31. ff. 3, 4, 5 ♀.

Myrmica unispinosa, Fabr. Ent. Syst. ii. 359, 39.

Myrmecia hæmatodes, Fabr. Syst. Piez. 425, 7.

Myrmecia unispinosa, Fabr. Syst. Piez. 423, 1.

Odontomachus hæmatodes, Latr. Gen. Crust. et Ins. iv. 128 ☿; Smith, Cat. Hym. Ins. vi. 76, 1; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 51, 74; Emery, Ann. Soc. Ent. Fr. 1893, 243, 15.

Odontomachus simillimus, Smith, Cat. Hym. Ins. B. M. vi. 80, 11 ♀; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 15; Smith, Jour. Linn. Soc. xi. (1867), 319, 4.

Colombo (*Yerbury coll.*); Kandy, Nuwara Eliya.

Genus Anochetus, Mayr.

60. Anochetus yerburyi, Forel (MS.).

Anochetus yerburyi, Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 53, 79.

Genus Bothroponera, Mayr.

61. Bothroponera rufipes (Jerdon).

Ponera rufipes, Jerd. Madr. Jour. Lit. & Sci. 1851, 119.

Pachychondila rufipes, Smith, Cat. Hym. Ins. B. M. vi. 106, 4 ☿.

Trincomalee (*Yerbury coll.*); Pundaloya (*Green coll.*).

62. BOTHROPONERA TESSERINODA (Emery).

Ponera tesserinoda, Emery, Ann. d. Mus. Civ. di Stor. Nat. Genova, 1876-77, 368; Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1879, 661; Emery, Ann. Soc. Ent. Fr. 1893, 242, 6.

Trincomalee (*Yerbury coll.*); Kandy.

Genus DIACAMMA, Mayr.

63. DIACAMMA VAGANS (Smith).

Ponera vagans, Smith, Jour. Linn. Soc. v. (1861), 103, 3; id. xi. (1867), 323, 42; Roger, Berl. ent. Zeitschr. 1860, 304, 29 ♀.

Diacamma vagans, Roger, Berl. ent. Zeitschr. 1863, 16, 482; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892) 54, 86.

Haycock Hill (*Yerbury coll.*).

64. DIACAMMA GEOMETRICA (Smith).

Ponera geometrica, Smith, Cat. Hym. Ins. B. M. vi. 86, 14 ♀; Jour. Linn. Soc. xi. (1867), 321, 11.

Diacamma geometrica, Roger, Berl. ent. Zeitschr. 1860, 301, 26.

Diacamma geometricum, Emery, Ann. Soc. Ent. Fr. 1893, 242, 5.

Colombo.

Genus PONERA, Latreille.

65. PONERA (SYSCIA) TYPHLA (Roger).

Syscia typhla, Roger, Berl. ent. Zeitschr. 1860, 20, 75 ♀.

Ponera typhla, Smith, Jour. Linn. Soc. xi. (1867), 322, 25.

66. PONERA (MYIOPIAS) AMBLYOPS (Roger).

Myopias ambliops, Roger, Berl. ent. Zeitschr. 1860, 39, 120 ♀.

Ponera amblyops, Smith, Jour. Linn. Soc. xi. (1867), 322, 26.

67. PONERA (LEPTOGENYS) FALCIGERA (Roger).

Leptogenys falcigera, Roger, Berl. ent. Zeitschr. 1860, 42, 122 ♀.

Ponera falcigera, Smith, Jour. Linn. Soc. xi. (1867), 322, 27.

Trincomalee (*Yerbury coll.*).

68. PONERA EXUNDANS (Walker).

Formica exundans, Walk. Ann. & Mag. Nat. Hist. ser. 3, iv. (1859), 371 ♂; Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 11.

Ponera exudans, Smith, Jour. Linn. Soc. xi. (1867), 323, 51.

69. PONERA MERITANS (Walker).

Formica meritans, Walk. Ann. & Mag. Nat. Hist. ser. 3, iv. (1859), 371 ♂.

Ponera meritans, Smith, Jour. Linn. Soc. xi. (1867), 323, 52.

70. PONERA ARANEOIDES, Le Guillou.

Ponera araneoides, Le Guillou, Ann. Soc. Ent. Fr. x. (1841), 317, 13; Smith, Jour. Linn. Soc. xi. (1867), 323, 50.

Ectatomma rugosa, Smith, Jour. Linn. Soc. iii. (1859), 143, 1 ☿ ♂.

71. PONERA COXALIS, Smith.

Ponera rugosa, Smith (nec Le Guillou), Cat. Hym. Ins. B. M. vi. 88, 20 ♀.

Ponera coxalis, Roger, Berl. ent. Zeitschr. 1860, 308, 43 ♀; Smith, Jour. Linn. Soc. xi. (1867), 321, 17.

72. PONERA LUTEIPES, Mayr.

Ponera luteipes, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien (1862), 722, 4 ☿ ♀; Emery, Ann. Soc. Ent. Fr. 1893, 242, 8.

Kandy (*Yerbury coll.*).

73. PONERA MELANARIA, Emery.

Ponera melanaria, Emery, Ann. Soc. Ent. Fr. 1893, 260 (footnote); id. ibid. 242, 7.

Colombo.

74. PONERA PUNCTATISSIMA, Roger.

Ponera punctatissima, Roger, Berl. ent. Zeitschr. 1859, 246; Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1878, 663; Emery, Ann. Soc. Ent. Fr. 1893, 242, 9.

Ponera simillima, Smith, Jour. Linn. Soc. v. (1861), 104, 5 ☿.

Kandy.

75. PONERA GLEADOWI, Forel (MS.).

Ponera gleadowi, Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 55, 91; Emery, Ann. Soc. Ent. Fr. 1893, 242, 10.

Matale.

Genus DREPANOGNATHUS, Smith.

76. DREPANOGNATHUS CRUENTATUS, Smith.

Drepanognathus cruentatus, Smith, Cat. Hym. Ins. B. M. vi. 82, 2.

Harpegnathus cruentatus, Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 56, 93.

Kandy road (*Yerbury coll.*).

Genus LOBOPELTA, Mayr.

77. LOBOPELTA DIMINUTA (Smith).

Ponera diminuta, Smith, Cat. Hym. Ins. B. M. vi. 89, 23; Jour. Linn. Soc. xi. (1867), 321, 21.

Lobopelta diminuta, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien,

1863, 734, 1; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 58, 96; Emery, Ann. Soc. Ent. Fr. 1893, 243, 13.

Kandy (*Yerbury coll.*).

78. LOBOPELTA CHINENSIS, Mayr.

Lobopelta chinensis, Mayr. Verh. d. k.-k. zool.-bot. Ges. Wien, 1870, 965 ☿; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 57, 95; Emery, Ann. Soc. Ent. Fr. 1893, 242, 11.

Andankubam (*Yerbury coll.*).

79. LOBOPELTA YERBURYI, Forel.

Lobopelta yerburyi (Forel in MS. teste Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 58, 98).

Kandy road (*Yerbury coll.*).

80. LOBOPELTA OCELLIFERA (Roger).

Ponifera ocellifera, Roger, Berl. ent. Zeitschr. 1861, 13 ☿; Smith, Jour. Linn. Soc. xi. (1867), 322, 24.

Lobopelta ocellifera, Roger, Berl. ent. Zeitschr. 1863, Verz. Form.-Gatt. u. Art. 19, 535; Emery, Ann. Soc. Ent. Fr. 1893, 243, 14.

Lobopelta distinguenda, Emery, Ann. d. Mus. di Civ. Stor. Nat. Genova, ser. 2, v. (1887–88), 430, 127 ☿.

Kandy, Trincomalee (*Yerbury coll.*).

81. LOBOPELTA PEUQUETI, André.

Lobopelta peuqueti, André, Rev. Ent. vi. (1887), 292; Emery, Ann. Soc. Ent. Fr. 1893, 243, 15.

Kandy.

Genus MYOPOPONE, Roger.

82. MYOPOPONE MACULATA, Roger.

Myopopone maculata, Roger, Berl. ent. Zeitschr. 1861, 52 ☿ ♀; Emery, Ann. Soc. Ent. Fr. 1893, 240, 1.

Cottawa.

Genus CENTROMYRMEX, Mayr.

83. CENTROMYRMEX FEÆ (Emery).

Spalacomyrmex feæ, Emery, Ann. d. Mus. Civ. di Stor. Nat. Genova, ser. 2, vii. (1889), 491 7 ☿; Ann. Soc. Ent. Fr. 1893, 240, 2.

Peradeniya (*Yerbury coll.*); Kandy.

Genus OOCERÆA, Roger.

84. OOCERÆA FRAGOSA, Roger.

Oocerœa fragosa, Roger, Berl. ent. Zeitschr. 1862, 249, t. i 16*a* ☿; Smith, Jour. Linn. Soc. xi. (1867), 324, 1.

Genus Cryptopone, Emery.

85. Cryptopone testácea (Motschoulsky).

Amblyopone testacea, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 15 ♀; Smith, Jour. Linn. Soc. xi. (1867) 324, 2.

Cryptopone testacea, Emery, Ann. Soc. Ent. Fr. 1893, 240, 3 ☿.

Nawalapitiya.

Genus Dorylus, Shuckard.

86. Dorylus curtsii, Shuckard.

Typhlopone curtsii, Shuck. Ann. & Mag. Nat. Hist. ser. 1, v. (1840), 265 ☿; Smith, Cat. Hym. Ins. B. M. vi. 112, 11; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 15.

87. Dorylus orientalis, Westwood.

Dorylus orientalis, Westw. Proc. Zool. Soc. 1835, 72; Shuck. Ann. & Mag. Nat. Hist. ser. 1, v. (1840), 320, 7; Westw. Arc. Ent. i. 80, 7; Smith, Cat. Hym. Ins. B. M. vii. 3, 8; Jour. Linn. Soc. xi. (1867), 335, 2.

Pundaloya (*Green coll.*).

Genus Ænictus, Shuckard.

88. Ænictus porozonoides, Walker.

Ænictus porozonoides, Walk. Ann. & Mag. Nat. Hist. ser. 3, v. (1860), 306 ♂; Tenn. Nat. Hist. Ceylon, ch. xii. 454; Smith, Jour. Linn. Soc. xi. (1867), 336, 5.

89. Ænictus ceylonicus (Mayr).

Typhlatta ceylonica, Mayr, Sitzungsb. d. k. Akad. d. Wissensch. 1866, 22 ☿.

90. Ænictus bengalensis (Mayr).

Typhlatta bengalensis, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1878, 669 ☿; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 177, 115.

Colombo (*Rothney coll.*).

Genus Cataulacus, Smith.

91. Cataulacus taprobanæ, Smith.

Cataulacus taprobanæ, Smith, Trans. Ent. Soc. ser. 2, ii. (1853), 225, 1, pl. xx. f. 10 ☿; Cat. Hym. Ins. B. M. vi. 195, 1; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 21; Smith, Jour. Linn. Soc. xi. (1867), 335, 4;

Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 178, 122; Emery, Ann. Soc. Ent. Fr. 1893, 248, 38.

Colombo (*Rothney coll.*); Belangoda (*Yerbury coll.*); Pundaloya (*Green coll.*); Kandy.

92. CATAULACUS SIMONI, Emery.

Cataulacus simoni, Emery, Ann. Soc. Ent. Fr. 1893, 248, 39 ☿.

Kandy, Colombo.

Genus MERANOPLUS, Smith.

93. MERANOPLUS BICOLOR (Guérin).

Cryptocerus bicolor, Guér. Icon. Règ. Anim. 425.

Meranoplus bicolor, Smith, Trans. Ent. Soc. ser. 2, ii. (1853), 224, 1; Cat. Hym. Ins. B. M. vi. 193, 2; Jour. Linn. Soc. xi. (1867), 334, 4; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 179, 123; Emery, Ann. Soc. Ent. Fr. 1893, 248, 37.

Meranoplus villosus, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1859, 115; id. ibid. 1863, 21.

Meranoplus dimicans, Walk. Ann. & Mag. Nat. Hist. ser. 3, iv. (1859), 375.

Kandy (*Yerbury coll.*); Galle; Colombo; Cottawa.

Genus HOLCOMYRMEX, Mayr.

94. HOLCOMYRMEX CRINICEPS, Mayr.

Holcomyrmex criniceps, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1878, 672 ☿; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 181, 126.

Trincomalee (*Yerbury coll.*).

Genus MYRMICARIA, Saunders.

95. MYRMICARIA SUBCARINATA (Smith).

Heptacondylus subcarinata, Smith, Jour. Linn. Soc. ii. (1858), 73, 2; Cat. Hym. Ins. B. M. vi. 142, 1; Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1863, 756, 3.

Myrmicaria subcarinata, Smith, Jour. Linn. Soc. xi. (1867), 330, 4; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 183, 134.

Kandy (*Yerbury coll.*).

96. MYRMICARIA BRUNNEA, Saunders.

Myrmicaria brunnea, Saund. Trans. Ent. Soc. iii. (1841), 57, pl. v. f. 2 ♂; Smith, Cat. Hym. Ins. B. M. vi. 141, 1, pl. x. ff. 6 7, 8; Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1863, 757, 1.

97. MYRMICARIA FODIENS (Jerdon).

Myrmica fodiens, Jerd. Ann. & Mag. Nat. Hist. 1854, xiii. p. 55.

Myrmicaria fodiens, Emery, Ann. Soc. Ent. Fr. 1893, 249, 41.

Kandy.

Genus TETRAMORIUM, Mayr.

98. TETRAMORIUM TRANSVERSARIUM, Roger.

Tetramorium transversarium, Roger, Berl. ent. Zeitschr. 1863, 181, 73 ☿; Emery, Ann. Soc. Ent. Fr. 1893, 246, 31.

Nuwara Eliya.

99. TETRAMORIUM PACIFICUM, Mayr.

Tetramorium pacificum, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1870, 38 ☿ ♀; Emery, Ann. Soc. Ent. Fr. 1893, 246, 32.

Colombo, Kandy.

100. TETRAMORIUM (XIPHOMYRMEX) TORTUOSUM, Roger.

Tetramorium tortuosum, Roger, Berl. ent. Zeitschr. 1863, 181, 72 ☿ ♀; Emery, Ann. Soc. Ent. Fr. 1893, 246, 33.

Kandy (*Yerbury coll.*).

101. TETRAMORIUM (XIPHOMYRMEX) PILOSUM, Emery.

Tetramorium (*Xiphomyrmex*) *pilosum*, Emery, Ann. Soc. Ent. Fr. 1893, 247, 34 ☿.

Kandy.

Genus MONOMORIUM, Mayr.

102. MONOMORIUM VASTATOR (Smith).

Myrmica vastator, Smith, Jour. Linn. Soc. ii. (1858), 71, 3 ☿; id. ibid. xi. (1867), 325, 4.

Monomorium vastator, Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 186, 143.

Trincomalee (*Yerbury coll.*).

103. MONOMORIUM SPECULARE, Mayr.

Monomorium speculare, Mayr, Sitz. d. k. Akad. Wissen. 1866, 26 ☿; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 187, 149.

Trincomalee (*Yerbury coll.*).

104. MONOMORIUM GLYCIPHILUM (Smith).

Myrmica glyciphila, Smith, Cat. Hym. Ins. B. M. vi. 125, 45 ☿; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 15; Smith, Jour. Linn. Soc. xi. (1867), 327, 39.

Monomorium glyciphilum, Roger, Berl. ent. Zeitschr. 1863, Verz. Form.-Gatt. u. Art. 32, 876.

105. MONOMORIUM DESTRUCTOR (Jerdon).

Atta destructor, Jerd. Madr. Jour. Lit. & Sci. 1851, 105 ♀; Roger, Berl. ent. Zeitschr, 1863, Verz. Form.-Gatt. u. Art. 34, 971.

Monomorium destructor, Emery, Ann. Soc. Ent. Fr. 1893, 243.

Colombo.

106. MONOMORIUM LATINODE, Mayr.

Monomorium latinode, Mayr, Ann. d. Mus. Civ. di Stor. Nat. Genova, ser. ii. (1872), 152, 54 ☿; Emery, Ann. Soc. Ent. Fr. 1893, 243, 19.

Kandy.

Genus LOPHOMYRMEX, Emery.

107. LOPHOMYRMEX QUADRISPINOSUS (Jerdon).

Œcodoma quadrispinosa, Jerd. Madr. Jour. Lit. & Sci. 1851, 111; Ann. & Mag. Nat. Hist. ser. 2, xiii. (1854), 52.

Pheidole quadrispinosa, Smith, Cat. Hym. Ins. B. M. vi. 174, 9; Roger, Berl. ent. Zeitschr. 1863, Verz. Form.-Gatt. u. Art. 31, 841; Smith, Jour. Linn. Soc. xi. (1867), 331, 7.

Lophomyrmex quadrispinosus, Emery, Ann. Soc. Ent. Fr. 1893, 243, 20.

Kandy.

Genus TRIGLYPHOTHRIX, Forel.

108. TRIGLYPHOTHRIX WALSHI, Forel.

Triglyphothrix walshi, Forel, Jour. Bomb. Nat. Hist. Soc. v. (1890), 396 ☿ ♀; Emery, Ann. Soc. Ent. Fr. 1893, 248, 33.

Nawalapitiya.

109. TRIGLYPHOTHRIX OBESUM (André).

Tetramorium obesum, André, Rev. Ent. vi. (1887), 294.

Triglyphothrix obesum, Emery, Ann. Soc. Ent. Fr. 1893, 248, 34

Kandy.

Genus ACANTHOMYRMEX, Emery.

110. ACANTHOMYRMEX LUCIOLÆ, Emery.

Acanthomyrmex luciolæ, Emery, Ann. Soc. Ent. Fr. 1893, 245, 30 ☿.

Kandy.

Genus SOLENOPSIS, Westwood.

111. SOLENOPSIS GEMINATA (Fabricius).

Atta geminata, Fabr. Syst. Piez. 423, 6.

Solenopsis mandibularis, Westw. Ann. & Mag. Nat. Hist. 1841, vi. 87 ☿.

Atta clypeata, Smith, Cat. Hym. Ins. B. M. vi. 169, 30.

Solenopsis cephalotes, Smith, Jour. Linn. Soc. iii. (1859), 149; id. ibid. xi. (1867), 333, 1.

Solenopsis geminata, Roger, Berl. ent. Zeitschr. 1862, 289; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 189, 160; Emery, Ann. Soc. Ent. Fr. 1893, 243, 23.

Kandy (*Yerbury coll.*); Colombo.

Genus STRUMIGENYS, Smith.

112. STRUMIGENYS LYROESSA (Roger).

Labidogenys lyroessa, Roger, Berl. ent. Zeitschr. 1862, 251, pl. i. f. 17 *a* ☿; Smith, Jour. Linn. Soc. xi. (1867), 334, 1.

113. STRUMIGENYS GODEFFROYI, Mayr.

Strumigenys godeffroyi, Mayr, Sitz. d. k. Akad. Wissen. 1866, 33 ☿; Emery, Ann. Soc. Ent. Fr. 1893, 249, 40.

Kandy.

Genus PHEIDOLOGETON, Mayr.

114. PHEIDOLOGETON DIVERSUS (Jerdon).

Œcodoma diversa, Jerd. Madr. Jour. Lit. & Sci. 1851, 109; Ann. & Mag. Nat. Hist. ser. 2, xiii. (1854), 51, 11.

Pheidole diversa, Smith, Cat. Hym. Ins. B. M. vi. 174, 6; Jour. Linn. Soc. xi. (1867), 331, 4.

Pheidologeton diversus, Roger, Berl. ent. Zeitschr. 1863, Verz. Form.-Gatt. u. Art. 30, 820; Emery, Ann. Soc. Ent. Fr. 1893, 249, 21.

Colombo; Ratgama-Kellei.

115. PHEIDOLOGETON LABORIOSUS (Smith).

Solenopsis laboriosa, Smith, Jour. Linn. Soc. vi. (1862), 48, 2 ☿; id. xi. (1867), 333, 3.

Pheidologeton laboriosus, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1863, 750, 2; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 190, 163.

Kandy (*Yerbury coll.*).

116. PHEIDOLOGETON NANUS (Roger).

Pheidole nanus, Roger, Berl. ent. Zeitschr. 1863, 191, 84 ☿.

Pheidologeton nanus, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1862, 442; Emery, Ann. Soc. Ent. Fr. 1893, 249, 22.

Kandy.

117. PHEIDOLOGETON SILENUS (Smith).

Pheidole silenus, Smith, Cat. Hym. Ins. B. M. vi. 176, 14 ☿; Jour. Linn. Soc. xi. (1867), 332, 12.

Pheidologeton silenus, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1863, 103, 3 ('Novara' expedition).

118. PHEIDOLOGETON TAPROBANÆ (Smith).

Pheidole taprobanæ, Smith, Cat. Hym. Ins. B. M. vi. 175, 12 ♀; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 21; Smith, Jour. Linn. Soc. xi. (1867), 331, 10.

Pheidologeton taprobanæ, Roger, Berl. ent. Zeitschr. 1863, Verz. Form.-Gatt. u. Art. 30, 823.

Genus Pheidole, Westwood.

119. Pheidole indica, Mayr.

Pheidole indica, Mayr. Verh. d. k.-k. zool.-bot. Ges. Wien, 1879, 679; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 194, 177.

Baddegama (*Yerbury coll.*).

120. Pheidole rugosa, Smith.

Pheidole rugosa, Smith, Cat. Hym. Ins. B. M. vi. 175, 13 ☿; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 21; Smith, Jour. Linn. Soc. xi. (1867), 321, 11.

Kandy (*Yerbury coll.*).

121. Pheidole janus, Smith.

Pheidole janus, Smith, Cat. Hym. Ins. B. M. vi. 175, 11 ☿, pl. ix. ff. 13–17; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 21; Smith, Jour. Linn. Soc. xi. (1867), 321, 9.

122. Pheidole sulcaticeps, Roger.

Pheidole sulcaticeps, Roger, Berl. ent. Zeitschr. 1863, 193, 85 ☿ ♀ ♂; Smith, Jour. Linn. Soc. xi. (1867), 332, 25; Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1879, 675.

123. Pheidole wood-masoni, Forel.

Pheidole wood-masoni, Forel, Jour. Asiat. Soc. Beng. liv. (1887), pt. 2, 180, 22; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 195, 185; Emery, Ann. Soc. Ent. Fr. 1893, 243, 28.

Haragam near Kandy (*Yerbury coll.*); Matale.

124. Pheidole latinoda, Roger.

Pheidole latinoda, Roger, Berl. ent. Zeitschr. 1863, 195, 86 ☿; Smith, Jour. Linn. Soc. xi. (1867), 332, 26; Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1879, 675; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 191, 164; Emery, Ann. Soc. Ent. Fr. 1893, 243, 27.

Colombo.

125. Pheidole didita (Walker).

Atta didita, Walk. Ann. & Mag. Nat. Hist. ser. 3, iv. (1859), 375; Tenn. Nat. Hist. Ceylon, ch. xii. 454; Smith, Jour. Linn. Soc. xi. (1867), 333, 28.

126. Pheidole megacephala (Fabricius).

Formica megacephala, Fabr. Ent. Syst. ii. 361, 47; Latr. Hist. Nat. Fourm. 232, t. 10. f. 67; Coqueb. Illustr. i. t. vi. f. 9.

Orcothphora pusilla, Heer (Hausameisen Madeira's, ☿ ♀ ♂).

Myrmica trinodis, Los. Mem. Accad. Sci. Torino, 1834, t. 37, 327.
Myrmica lævigata, Smith, Cat. Hym. Ins. B. M. vi. 121, 30.
Pheidole megacephala, Roger, Berl. ent. Zeitschr. 1863, Verz. Form.-Gatt. u. Art. 30, 829; Emery, Ann. Soc. Ent. Fr. 1893, 243, 26.
Colombo, Kandy.

127. PHEIDOLE PRONOTALIS, Forel, MS.

Pheidole pronotalis, Emery, Ann. Soc. Ent. Fr. 244, 29.
Kandy, Nuwara Eliya; Hakgala (*Yerbury coll.*).

128. PHEIDOLE CEYLONICA (Motschoulsky).

Orcothophora ceylonica, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 18; Smith, Jour. Linn. Soc. xi. (1867), 333, 29.
Nuwara Eliya.

Genus CREMASTOGASTER, Lund.

129. CREMASTOGASTER RANSONNETI, Mayr.

Cremastogaster ransonneti, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1868, 287; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 196, 192; Emery, Ann. Soc. Ent. Fr. 1893, 243, 25.
Nuwara Eliya (*Yerbury coll.*).

130. CREMASTOGASTER SUBNUDA, Mayr.

Cremastogaster subnuda, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1879, 682 ☿; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 197, 193.
Hakgala (*Yerbury coll.*).

131. CREMASTOGASTER DOHRNI, Mayr.

Cremastogaster dohrni, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1879, 682; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 197, 196; Emery, Ann. Soc. Ent. Fr. 1893, 243, 24.
Trincomalee (*Yerbury coll.*).

132. CREMASTOGASTER CONTENTA, Mayr.

Cremastogaster contenta, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1879, 685 ☿; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 199, 200.
Trincomalee (*Yerbury coll.*).

133. CREMASTOGASTER ROGENHOFERI, Mayr.

Cremastogaster rogenhoferi, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1879, 683 ☿; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 197, 198.

134. CREMASTOGASTER ANTHRACINA, Smith.

Cremastogaster anthracinus, Smith, Jour. Linn. Soc. ii. (1858),

75, 1 ♀; Cat. Hym. Ins. B. M. vi. 136, 5; Jour. Linn. Soc. xi. (1867), 329, 2.

Cremastogaster anthracina, Mayr, Verh. d. k.-k. zool.-bot. Ges. Wien, 1878, 682.

135. CREMASTOGASTER BRUNNEA, Smith.

Cremastogaster brunneus, Smith, Jour. Linn. Soc. ii. (1858), 75, 2 ♀; Cat. Hym. Ins. B. M. vi. 138, 10; Jour. Linn. Soc. xi. (1867), 329, 3.

136. CREMASTOGASTER PELLENS, Walker.

Cremastogaster pellens, Walk. Ann. & Mag. Nat. Hist. ser. 3, iv. (1859), 374 ♀; Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 21; Smith, Jour. Linn. Soc. xi. (1867), 330, 9.

137. CREMASTOGASTER DEPONENS, Walker.

Cremastogaster deponens, Walk. Ann. & Mag. Nat. Hist. ser. 3, iv. (1859), 374 ♀; Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 21; Smith, Jour. Linn. Soc. xi. (1867), 330, 10.

138. CREMASTOGASTER FORTICULUS, Walker.

Cremastogaster forticulus, Walk. Ann. & Mag. Nat. Hist. ser. 3, iv. (1859), 375 ♀; Tenn. Nat. Hist. Ceylon, ch. xii. 454; Smith, Jour. Linn. Soc. xi. (1867), 330, 11.

139. CREMASTOGASTER APICALIS, Motschoulsky.

Cremastogaster apicalis, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 20 ♀; Smith, Jour. Linn. Soc. xi. (1867), 330, 12.

140. CREMASTOGASTER BRUNNESCENS, Motschoulsky.

Cremastogaster brunnescens, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 20; Smith, Jour. Linn. Soc. xi. (1867), 330, 13.

Genus SIMA, Roger.

141. SIMA RUFONIGRA (Jerdon).

Eciton rufonigra, Jerd. Madr. Jour. Lit. & Sci. 1851, 53 ♀; Ann. & Mag. Nat. Hist. ser. 2, xiii. (1854), 53.

Pseudomyrma rufonigra, Smith, Cat. Hym. Ins. B. M. vi. 159, 24; Jour. Linn. Soc. xi. (1867), 328, 4.

Sima rufonigra, Roger, Berl. ent. Zeitschr. 1863, Verz. Form.-Gatt. u. Art. 25, 719; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 200, 210.

Kandy (*Yerbury coll.*).

142. SIMA NIGRA (Jerdon).

Eciton nigrum, Jerd. Madr. Jour. Lit. & Sci. 1851 112 ♀; Ann. & Mag. Nat. Hist. ser. 2, xiii. (1854), 54.

Pseudomyrma nigra, Smith, Cat. Hym. Ins. B. M. vi. 159, 25; Jour. Linn. Soc. xi. (1867), 328, 9.

Sima nigra, Roger, Berl. ent. Zeitschr. 1863, Verz. Form.-Gatt. u. Art. 25, 720; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 201, 211; Emery, Ann. Soc. Ent. Fr. 1893, 243, 16.

Kandy.

143. SIMA ATRATA (Smith).

Tetraponera atrata, Smith, Ann. & Mag. Nat. Hist. ser. 2, ix. (1850), 44.

Pseudomyrma atrata, Smith, Cat. Hym. Ins. B. M. vi. 159, 26; Jour. Linn. Soc. xi. (1867), 328, 1.

144. SIMA ALLABORANS (Walker).

Pseudomyrma allaborans, Walk. Ann. & Mag. Nat. Hist. ser. 3, iv. (1859), 375 ☿; Tenn. Nat. Hist. Ceylon, ch. xii. 454; Smith, Jour. Linn. Soc. xi. (1867), 328, 11.

Cerapachys femoralis, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 21.

Cerapachys ceylonica, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 22.

Sima compressa, Roger, Berl. ent. Zeitschr. 1863, 179, 68 ☿; Smith, Jour. Linn. Soc. xi. (1867), 328, 1; Wroughton, Jour. Bomb. Nat. Hist. Soc. vii. (1892), 202, 212.

Sima allaborans, Emery, Ann. Soc. Ent. Fr. 1893, 243, 17.

Colombo, Kandy.

The following have been recorded from Ceylon by Smith, Walker, or Motschoulsky, but, so far as I know, not lately procured or perhaps not identified:—

145. MYRMICA BASALIS, Smith, Cat. Hym. Ins. B. M. vi. 125, 43.

146. MYRMICA CONTIGUA, Smith, id. ibid. 125, 44.

147. MYRMICA (?) CONSTERNANS, Walker, Ann. & Mag. Nat. Hist. ser. 3, iv. (1859), 374 ♀ ♂.

148. MYRMICA PALLINODIS, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 16 ☿.

149. MYRMICA OBSCURATA, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 16 ☿.

Family MUTILLIDÆ, Leach.

Genus MUTILLA, Linnæus.

150. MUTILLA ÆSTUANS, Gerstaecker.

Mutilla æstuans, Gerstaeck. Pet. Reis. 487, pl. 31. f. 6; Radoszk. & Sich. Horæ Soc. Ent. Ross. 1869, 223, 55; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. v. (1892), 116, 2.

151. MUTILLA ANALIS, Lepeletier.

Mutilla analis, Lepel. Hym. iii. 630, 52; Radoszk. & Sich. Hor. Soc. Ent. Ross. 1869, 284, 125; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. v. (1892), 116, 3.
Mutilla fuscipennis, Fab. Syst. Piez. 436, 35.
Mutilla rufogastra, Lepel. Hym. iii. 629, 51 ♂; Smith, Cat. Hym. Ins. B. M. iii. 36, 185.

152. MUTILLA AUREORUBRA, Radoszkovsky.

Mutilla aureorubra, Radoszk. & Sich. Hor. Soc. Ent. Ross. 1869, 304, 1 ♀; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 117, 9.

153. MUTILLA EGREGIA, Saussure.

Mutilla egregia, Sauss. (*nec* Klug) Ann. Soc. Ent. Fr. 1867, 351, 1, pl. 8. f. 1; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 117.

154. MUTILLA BICINCTA, Saussure.

Mutilla bicincta, Sauss. Ann. Soc. Ent. Fr. 1867, 355, pl. 8. f. 4; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 117, 14.

155. MUTILLA CEYLANENSIS, Radoszkovsky.

Mutilla ceylanensis, Radoszk. & Sich. Hor. Soc. Ent. Ross. 1869, 247, 80 ♀; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 118, 19.

156. MUTILLA CHRYSOPHTHALMA, Klug.

Mutilla chrysophthalma, Klug, in Hempr. et Erenb. Symb. Phys. Hym. 17, pl. v. f. 3; Radoszk. & Sich. Hor. Soc. Ent. Ross. 1869, 232, 67 ♀; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 118, 20.

157. MUTILLA CORONATA, Saussure.

Mutilla coronata, Sauss. Hym. d. Novara-Reise, 106, 4 ♀; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 118, 23.

158. MUTILLA DENTICOLLIS, Motschoulsky.

Mutilla denticollis, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 22; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 118, 28.

159. MUTILLA DIMIDIATA, Lepeletier.

Mutilla dimidiata, Lepel. Hym. iii. 628, 50; Radoszk. & Sich. Hor. Soc. Ent. Ross. 1869, 285, 126; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 118, 29.

160. MUTILLA HEXAOPS, Saussure.

Mutilla hexaops, Sauss. Ann. Soc. Ent. Fr. 1867, 169, 7, t. 8.

f. 6; Radoszk. & Sich. Hor. Soc. Ent. Ross. 1869, 307, 7; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 119, 37.
Nattan.

161. MUTILLA HUMBERTIANA, Saussure.

Mutilla humbertiana, Sauss. Ann. Soc. Ent. Fr. 1867, 353, 2♀, t. 8. f. 2; Radoszk. & Sich. Hor. Soc. Ent. Ross. 1869, 305, 2; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 119, 38.
Trincomalee.

162. MUTILLA INSULARIS, Cameron.

Mutilla insularis, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 119, 42, & 133.
Trincomalee (*Yerbury coll.*).

163. MUTILLA INTERMEDIA, Saussure.

Mutilla intermedia, Sauss. Ann. Soc. Ent. Fr. 1867, 354, 4♀; Radoszk. & Sich. Hor. Soc. Ent. Ross. 1867, 306, 4; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 119, 43.

164. MUTILLA KANARÆ, Cameron.

Mutilla kanaræ, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 119, 44, & 134.
Trincomalee (*Yerbury coll.*).

165. MUTILLA KANTHELLÆ, Cameron.

Mutilla kanthellæ, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 119, 45, & 124.
Kanthella (*Yerbury coll.*).

166. MUTILLA MACULO-FASCIATA, Saussure.

Mutilla maculo-fasciata, Sauss. Hym. d. Novara-Reise, 107, 5♀; Radoszk. & Sich. Hor. Soc. Ent. Ross. 309; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 120, 46.

167. MUTILLA METALLICA, Cameron.

Mutilla metallica, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 120, 48, & 128.

168. MUTILLA OCELLATA, Saussure.

Mutilla ocellata, Sauss. Ann. Soc. Ent. Fr. 1867, 356, 6; Radoszk. & Sich. Hor. Soc. Ent. Ross. 307, 6♀; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 120, 53.

169. MUTILLA OPULENTA, Smith.

Mutilla opulenta, Smith, Cat. Hym. Ins. B. M. iii. 34, 180♂; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 120, 55.
Kanthalla (*Yerbury coll.*).

170. MUTILLA SUBINTRANS, Radoszkovsky.

Mutilla subintrans, Radoszk. & Sich. Hor. Soc. Ent. Ross. 1867, 228, 62 ♀ ; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 122, 75.

171. MUTILLA SOROR, Saussure.

Mutilla soror, Sauss. Ann. Soc. Ent. Fr. 1867, 353, t. 8. f. 3; Radoszk. & Sich. Hor. Soc. Ent. Ross. 1867, 306, 3 ♀ ; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 122, 76.

Habrouenne.

172. MUTILLA SIBYLLA, Smith.

Mutilla sibylla, Smith, Jour. Linn. Soc. ii. (1858), 86, 11 ♀ ; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1867, 22; Smith, Jour. Linn. Soc. xi. (1867), 339, 47 ; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892) 122, 74.

173. MUTILLA TAPROBANÆ, Cameron.

Mutilla taprobanæ, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 122, 81, & 125.

Trincomalee (*Yerbury coll.*).

174. MUTILLA YERBURYI, Cameron.

Mutilla yerburyi [1], Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 123, 87, & 135.

Mahaagang (*Yerbury coll.*).

Genus METHOCA, Latreille.

175. METHOCA NIGRA, sp. nov. (Plate XV. fig. 4.)

♂. L. 8–11 millim. Exp. 17–20 millim.

Black and shining; the wings broad, hyaline and iridescent, with the apical half faintly shaded with fuscous; legs piceous, tarsi paler.

Head about as broad as the thorax, closely and finely punctured; mandibles black; clypeus much broader than high, its anterior margin semicircular; antennæ opaque black, thick and somewhat fusiform. Thorax: the pro- and mesonotum above finely and closely punctured, the metanotum smooth, posteriorly truncated, with three longitudinal short carinæ running from its base to the edge of the truncation, from whence the lateral carinæ are continued obliquely outwards to the sides of the metathorax; the wings hyaline, iridescent in certain lights, faintly shaded with light fuscous especially on the anterior wing beyond the basal nervure; legs piceous, the tarsi paler, the anterior tibiæ and tarsi below testaceous.

Abdomen shining, rather sparsely punctured above, and slightly

[1] Either by a slip of the pen or through a printer's error, Col. Yerbury's name is spelt "Yerburgh" all through Mr. Cameron's paper, consequently this species stands as "*Yerburghi*" instead of "*Yerburyi*" in the paper. I have restored the true spelling.

pubescent; the basal segment about half the width of the 2nd and curved upwards; a deep transverse sulcation close to the apical margin of the 1st segment and another close to the constricted base of the 2nd segment, the latter sulcation continued on the underside of the abdomen.

Pundaloya (*Green coll.*).

Described from three specimens in my collection from various parts of Tenasserim and from two specimens in Mr. Green's collection. This species resembles *M. gracilis*, Smith, from Celebes, but this latter has the prothorax smooth, the metathorax coarsely rugose, the legs rufo-piceous, and the basal segment marked with a central *longitudinal* channel. From *M. orientalis*, Smith, found in Northern India, it differs considerably in size and coloration.

Family Scoliidæ, Leach.

Genus Scolia, Fabricius.

I. *With three cubital cells=Triscolia*, Saussure & Sichel.

176. Scolia rubiginosa, Fabricius.

Scolia rubiginosa, Fabr. Ent. Syst. ii. 230, 8; Syst. Piez. 241, 10; Coquebert, Illustr. tab. 13. f. 4 ♂; Klug, Web. u. Mohr, Beitr. ii. 211, 38; Lepel. Hym. iii. 518, 2; Burm. Cat. Scol. 19, 11; Smith, Cat. Hym. Ins. B. M. iii. 111, 123; Sauss. & Sich. Cat. Spec. Gen. Scol. 45, 20; Smith, Jour. Linn. Soc. xi. (1867), 343, 4; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 101, 13.

Colombo, Pundaloya (*Green coll.*).

II. *With two cubital cells=Discolia*, Saussure & Sichel.

177. Scolia aureipennis, Lepeletier.

Scolia aureipennis, Lepel. Hym. iii. 525, 9 ♀; Sauss. & Sich. Cat. Spec. Gen. Scol. 109, 102; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 103, 25.

Scolia jurinei, Sauss. Mél. Hym. 45, 21.

Scolia instabilis, Smith, Cat. Hym. Ins. B. M. iii. 88, 11 ♀ ♂; Jour. Linn. Soc. xi. (1867), 345, 25.

Scolia ruficornis, Klug, Web. u. Mohr, Beitr. i. 25, 8.

Pundaloya, Udagama (*Green coll.*).

178. Scolia cyanipennis, Fabricius.

Scolia cyanipennis, Fabr. Syst. Piez. 244, 35; Burm. Cat. Scol. 37, 59; Smith, Cat. Hym. Ins. B. M. iii. 90, 21; Sauss. Ann. Soc. Ent. Fr. 1858, 209, 16; Sauss. & Sich. Cat. Spec. Gen. Scol. 103, 91; Smith, Jour. Linn. Soc. xi. (1867), 345, 21; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 102, 20.

179. Scolia quadripustulata, Fabricius.

Scolia quadripustulata, Fabr. Spec. Ins. i. 453, 13; Ent. Syst. ii.

234, 26; Syst. Piez. 244, 34; Burm. Cat. Scol. 36, 58; Lepel. Hym. iii. 528, 16; Smith, Cat. Hym. Ins. B. M. iii. 87, 7; Sauss. & Sich. Cat. Spec. Gen. Scol. 113, 108; Hym. d. Novara-Reise, 103, 1; Smith, Jour. Linn. Soc. xi. (1867), 345, 24; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 104, 30.

Larra quadripustulata, Fabr. Ent. Syst. ii. 222, 6.

Scolia binotata, Fabr. Syst. Piez. 244, 36.

Scolia bipunctata, Klug, Web. u. Mohr, Beitr. i. 35, 30 (var. ♂).

Scolia fasciato-punctata, Guér. Voy. Coq. ii. 254 (var. ♀).

Scolia fervida, Smith, Ann. & Mag. Nat. Hist. ix. (1852), 46 (♀ var.); Cat. Hym. Ins. B. M. iii. 89, 15.

180. Scolia indica, Saussure.

Scolia indica, Sauss. Mél. Hym. 46, 22, f. 10 ♀; Sauss. & Sich. Cat. Spec. Gen. Scol. 119, 118; Smith, Jour. Linn. Soc. xi. (1867), 348, 61; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 106, 40.

Scolia ignita, Smith, Cat. Hym. Ins. B. M. iii. 101, 77 ♀; Jour. Linn. Soc. xi. (1867), 348, 64.

Somparipo (*Green coll.*).

181. Scolia histrionica, Fabricius.

Scolia histrionica, Fabr. Ent. Syst. Suppl. 256, 35; Klug, Web. u. Mohr, Beitr. i. 25, 9; Sauss. & Sich. Cat. Spec. Gen. Scol. 121, 121 ♀; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 107, 43.

Scolia picteti, Sauss. Mel. Hym. 42, 18 ♀.

Scolia pulchra, Smith, Cat. Hym. Ins. B. M. iii. 88, 12; Jour. Linn. Soc. xi. (1867), 345, 26.

Pundaloya (*Green coll.*).

182. Scolia eliformis, Saussure.

Scolia eliformis, Sauss. & Sich. Cat. Spec. Gen. Scol. 120, 119 ♂; Smith, Jour. Linn. Soc. xi. (1867), 348, 62; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 107, 41.

Pundaloya (*Green coll.*).

Genus Elis, Fabricius.

I. *With three cubital cells = Trielis*, Saussure & Sichel.

183. Elis orientalis, Cameron.

Elis orientalis, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 112, 27.

II. *With two cubital cells = Dielis*, Saussure & Sichel.

184. Elis thoracica (Fabricius).

Tiphia thoracica, Fabr. Ent. Syst. Suppl. 254, 15; Syst. Piez. 235, 19.

Sphex albicollis, Christ, Hym. 260, t. 26. f. 1 ♀.

Sphex flavifrons, Christ, Hym. 261, t. 26. f. 2 ♀ (non ♂), & f. 3 ♀, var. *fulvo-villosa*.

Tiphia nigra, Fabr. Ent. Syst. ii. 225, 9; Syst. Piez. 234, 13.

Campsomeris aureicollis, Lepel. Hym. iii. 499, 6 ♀.

Scolia aureicollis, Smith, Cat. Hym. Ins. B. M. iii. 101, 79.

Elis thoracica, Saussure & Sichel, Cat. Spec. Gen. Scol. 188, 197; Hym. d. Novara Reise, 104, 2; Smith, Jour. Linn. Soc. xi. (1867), 350, 15; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 108, 4.

Elis aureicollis, Smith, Jour. Linn. Soc. xi. (1867), 350, 14.

Colombo, Pundaloya (*Green coll.*).

I have followed de Saussure in uniting the species with fulvous pubescence on the head and thorax (*aureicollis*, Lepel.) with the species having cinereous-white pubescence on the same parts. Smith, however, kept them distinct, and I am inclined to think he was right, as the puncturing on the head and thorax in the two species is different. On the other hand, *Elis fimbriata*, Burmeister, kept distinct by de Saussure, seems to me only a large form of *E. thoracica* (vera). The specimens in Mr. Green's collection are midway between typical *thoracica* and typical *fimbriata*.

185. Elis iris (Lepeletier).

Colpa iris, Lepel. Hym. iii. 547, 16 ♂.

Scolia iris, Burm. Cat. Scol. 26, 28 ♀ ♂; Smith, Cat. Hym. Ins. B. M. iii. 100, 75.

Elis phalerata, Sauss. Ann. Ent. Soc. Fr. (1858), 233, 45; Ent. Zeit. 1859, 268 ♀.

? *Scolia radula*, Klug, Web. u. Mohr, Beitr. i. 30, 19 ♂.

Elis iris, Sauss. & Sich. Cat. Spec. Gen. Scol. 201, 217; Smith, Jour. Linn. Soc. xi. (1867), 351, 29; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 110, 20.

Pundaloya (*Green coll.*).

Three males of a species belonging to the subgenus *Dielis*, in Mr. Green's collection, agree fairly well with the original description of this species by Lepeletier de St.-Fargeau.

186. Elis lindenii (Lepeletier).

Campsomeris lindenii, Lepel. Hym. iii. 500, 8 ♀.

Scolia 4-fasciata, Fabr. Ent. Syst. Suppl. 255, 16; Syst. Piez. 242, 20.

Elis lindenii, Sauss. & Sich. Cat. Spec. Gen. Scol. 204, 219; Smith, Jour. Linn. Soc. xi. (1867), 351, 30; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 112, 22.

Pundaloya (*Green coll.*).

187. Elis ceylonica (Kirby.).

Campsomeris ceylonica, Kirby, Trans. Ent. Soc. 1889, 452.

Elis ceylonica, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 111, 21.

Genus Tiphia, Fabricius.

188. Tiphia rufo-femorata, Smith.

Tiphia rufo-femorata, Smith, Cat. Hym. Ins. B. M. iii. 83, 7 ♀; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1892), 115, 4.

Pundaloya (*Green coll.*).

189. Tiphia consueta, Smith.

Tiphia consueta, Smith, Desc. New Spec. Hym. B. M. 184, 2 ♀; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, v. (1862), 116, 6.

Pundaloya (*Green coll.*).

190. Tiphia decrescens, Walker.

Tiphia decrescens, Walk. Ann. & Mag. Nat. Hist. ser. 4, iv. 1859, 376; Tennent's Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 22.

Family Pompilidæ, Leach.

Genus Pompilus, Fabricius.

191. Pompilus analis, Fabricius.

Sphex analis, Fabr. Ent. Syst. ii. 209, 42.

Pompilus analis, Fabr. Syst. Piez. 188, 4; Dahlb. Hym. Eur. i. 47 ♀; Lepel. Hym. iii. 439, 35; Smith, Cat. Hym. Ins. B. M. iii. 143, 124; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 24; Smith, Jour. Linn .Soc. xi. (1867), 352, 1; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 457, 1.

Pundaloya (*Green coll.*).

192. Pompilus perplexus, Smith.

Pompilus perplexus, Smith. Cat. Hym. Ins. B. M. iii. 147, 140 ♀.

Priocnemis perplexus, Smith, Jour. Linn. Soc. xi. (1867), 354, 4.

Salius perplexus, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 452, 43.

Pundaloya (*Green coll.*).

193. Pompilus canifrons, Smith.

Pompilus canifrons, Smith, Cat. Hym. Ins. B. M. iii. 146, 138 ♀.

Priocnemis canifrons, Smith, Jour. Linn. Soc. xi. (1867) 354, 2.

Salius canifrons, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891).

Pundaloya (*Green coll.*).

I have examined the types of *P. pedestris* and *P. canifrons*, Smith, both in the British Museum, and find that they belong to the genus *Pompilus* and not to *Priocnemis=Salius*, Cam. (*apud* Kohl).

194. POMPILUS ARROGANS, Smith.

Pompilus arrogans, Smith, Trans. Ent. Soc. 1873, pt. ii. 187, 3 ♀.

Pundaloya (*Green coll.*).

Originally received from Japan, this species seems to have a wide range; I have found it fairly common in Sikkim and Burma. There are two specimens in Mr. Green's collection.

195. POMPILUS ATROPOS, Smith.

Pompilus atropos, Smith, Desc. New Spec. Hym. B. M. 146, 22 ♀; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 480.

Pundaloya (*Green coll.*).

196. POMPILUS LUCIDULUS (Saussure).

Homonotus lucidulus, Sauss. Hym. d. Novara-Reise, 50, 1 ♀.

Pompilus lucidulus, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 459, 26.

197. POMPILUS IGNOBILIS, Saussure.

Pompilus ignobilis, Sauss. Hym. d. Novara-Reise, 60, 3 ♀; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 459, 22.

198. POMPILUS IGNICOLOR, sp. nov. (Plate XV. fig. 5.)

♀. L. 7 millim. Exp. 12 millim.

Head and thorax in front red, metathorax, legs and abdomen black, wings hyaline with a faint fuscous cloud towards the apex.

Head broad, subglobular, and opaque red, with fine close punctures; the clypeus twice as broad as high, its anterior margin narrowly smooth, shining, and recurved; front slightly convex, covered, as is the clypeus and the cheeks behind the eyes, with a fine sericeous silvery pile, only seen in certain lights; antennæ fuscous; the scape in front red; thorax, the pro- and mesothorax above, and the scutellum and postscutellum red; the metathorax, sides of the thorax, and pectus black; the prothorax rounded in front, posteriorly arched; the scutellum and postscutellum compressed laterally and prominent; the metathorax with a rounded slope to the apex; the whole of the thorax very finely and closely punctured; wings hyaline, the nervures fuscous, the anterior wings lightly infuscated from beyond the 2nd cubital cell, the extreme apex narrowly hyaline, the apex of the posterior wing also faintly clouded; legs black, the anterior femora, tibiæ, and tarsi testaceous red, the claws

unidentate at their base below; the abdomen subsessile, broad and opaque black. In certain lights the sides of the metathorax, the coxæ, and the basal segment of the abdomen are seen to be covered with a thin silvery pile.

Pundaloya (*Green coll.*).

This well-marked little species might, at first sight, be mistaken for *Pseudagenia ægina*, Smith; but, beyond the difference of genus, it can be distinguished by its red head, black metathorax, and non-fasciated wings.

199. POMPILUS ROTHNEYI, Cameron.

Pompilus rothneyi, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 460, 32 & 463.

Pundaloya (*Green coll.*).

Forms, as noted by Mr. Cameron, a transition to the *Ferreola* group of the genus *Pompilus*. Originally described from Bengal, it occurs also in Burma.

200. POMPILUS MIRANDUS (Saussure).

Ferreola miranda, Sauss. Hym. d. Novara-Reise, 49, 5 ♀.

Pompilus miranda, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 459, 28.

201. POMPILUS DIMIDIATIPENNIS (Saussure).

Ferreola dimidiatipennis, Sauss. Hym. d. Novara-Reise, 46, 1 ♀.

Pompilus dimidiatipennis, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 458, 13.

202. POMPILUS GREENII (Bingham).

Ferreola greenii, Bingh. Jour. Bomb. Nat. Hist. Soc. v. (1890), 240, 11 ♀.

Pompilus greenii, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 458, 18.

Pundaloya (*Green coll.*).

This species closely resembles the preceding, and may be identical with it, but I have provisionally kept it distinct, as the shape of the front of the head seems to distinguish it from *P. dimidiatipennis*.

Genus PSEUDAGENIA, Kohl.

203. PSEUDAGENIA BLANDA (Guérin).

Pompilus blandus, Guérin, Voy. Coq. Zool. ii. pt. 2, 260; Smith, Cat. Hym. Ins. B. M. iii. 143, 125.

Pompilus cyaneus, Lepel. Hym. iii. 446, 7.

Agenia blanda, Smith, Jour. Linn. Soc. xi. (1867), 354, 1.

Pseudagenia blanda, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 436, 6; Bingh. Jour. Bomb. Nat. Hist. Soc. viii. (1893), 369, 6.

Pundaloya (*Green coll.*).

204. PSEUDAGENIA ÆGINA (Smith).

Agenia ægina, Smith, Jour. Linn. Soc. ii. (1857), 94, 9 ♀; id. ibid. xi. (1867), 355, 6.

Pseudagenia ægina, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1894), 436, 1; Bingh. Jour. Bomb. Nat. Hist. Soc. viii. (1893), 368, 2.

Pundaloya (*Green coll.*).

205. PSEUDAGENIA ALARIS (Saussure).

Agenia alaris, Sauss. Hym. d. Novara-Reise, 52, 1 ♀.

Pseudagenia alaris, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 436, 2; Bingh. Jour. Bomb. Nat. Hist. Soc. viii. (1893), 368, 3.

206. PSEUDAGENIA BIPENNIS (Saussure).

Agenia bipennis, Sauss. Hym. d. Novara-Reise, 52, 3 ♂.

Pseudagenia bipennis, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. 436, 5; Bingh. Jour. Bomb. Nat. Hist. Soc. viii. (1893), 368, 4.

207. PSEUDAGENIA CONCOLOR (Saussure).

Agenia concolor, Sauss. Hym. d. Novara-Reise, 54, 6 ♂.

Pseudagenia concolor, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 437, 9.

The three preceding species occur also in Burma.

208. PSEUDAGENIA INSULARIS (Saussure).

Agenia insularis, Sauss. Hym. d. Novara-Reise, 455, 8 ♀.

Pseudagenia insularis, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 437, 15.

209. PSEUDAGENIA MICROMEGAS (Saussure).

Agenia micromegas, Sauss. Hym. d. Novara-Reise, 51, 1 ♀.

Pseudagenia micromegas, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 437, 19.

210. PSEUDAGENIA NANA (Saussure).

Agenia nana, Sauss. Hym. d. Novara-Reise, 55, 9 ♀.

Pseudagenia nana, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 438, 25.

211. PSEUDAGENIA OBSOLETA (Saussure).

Agenia obsoleta, Sauss. Hym. d. Novara-Reise, 56, 10 ♀.

Pseudagenia obsoleta, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 438, 24.

212. PSEUDAGENIA PLEBEJA (Saussure).

Agenia plebeja, Sauss. Hym. d. Novara-Reise, 57, 11 ♂.

Pseudagenia plebeja, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 438, 25.

Genus Salius, Fabricius.

I. Hemipepsis=Mygnimia Group.

213. Salius ceylonicus (Saussure).

Mygnimia ceylonica, Sauss. Hym. d. Novara-Reise, 64, 1 ♀.
Salius ceylonicus, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1801), 443, 7.

214. Salius fulvipennis (Fabricius).

Sphex fulvipennis, Fabr. Ent. Syst. ii. 218, 84.
Pompilus fulvipennis, Fabr. Syst. Piez. 198, 57; Smith, Cat. Hym. Ins. B. M. iii. 144, 127; Sauss. Hym. d. Novara-Reise, 58, 1 ♀ ♂.
Hemipepsis fulvipennis, Dahlb. Hym. Eur. i. 462.
Salius fulvipennis, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 444, 16.

215. Salius intermedius (Smith).

? *Hemipepsis flava*, Dahlb. (*nec* Fabr.) Hym. Eur. i. 462, 3.
Mygnimia intermedia, Smith, Ann. & Mag. Nat. Hist. ser. 4, xii. (1873), 257.
Salius intermedius, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 444, 18; Bingh. Jour. Bomb. Nat. Hist. Soc. viii. (1893), 372, 11.

Pundaloya (*Green coll.*).

In size this species is exceedingly variable; of thirteen females in Mr. Green's collection the smallest is 16 millim. in length, while the largest is 35 millim., or more than twice the size. One specimen, absolutely indistinguishable from the others in the colouring and sculpture of head and thorax, has the venation of the wings of *Priocnemis*: that is to say, the 1st recurrent nervure is not interstitial with the 2nd transverse cubital nervure, but terminates well before the apex of the 2nd cubital cell.

216. Salius rubidus (Bingham). (Plate XV. fig. 2.)

Mygnimia rubida, Bingh. Jour. Bomb. Nat. Hist. Soc. v. (1890), 238, 8 ♀ ♂.
Salius rubida, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 445, 27.

Pundaloya (*Green coll.*).

217. Salius convexus (Bingham).

Priocnemis convexus, Bingh. Jour. Bomb. Nat. Hist. Soc. v. (1890), 237, 6 ♀.
Salius convexus, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 451, 33; Bingh. Jour. Bomb. Nat. Hist. Soc. viii. (1893), 375, 18.

Pundaloya (*Green coll.*).

This species is also found in Burma.

II. Priocnemis group.

218. Salius madraspatanus (Smith).

Pompilus madraspatanus, Smith, Cat. Hym. Ins. B. M. iii. 144, 130 ♀; Jour. Linn. Soc. xi (1867), 352, 6.

Salius madraspatanus, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 451, 40; Bingh. Jour. Bomb. Nat. Hist. Soc. viii. (1893), 375, 19.

Pundaloya (*Green coll.*).

219. Salius properus, sp. nov. (Plate XV. fig. 7.)

♀. L. 11 millim. Exp. 23 millim.

Black, with a thin, silky, slate-coloured pile forming fasciæ on the abdomen above; wings fusco-hyaline.

Head broad, broader than the thorax, smooth; clypeus short, transversely oval, convex, an impressed line along and parallel to its anterior margin, the clypeus and front of the face silvery in certain lights and studded sparsely with black hairs; antennæ long, convolute at the apex. Thorax long, somewhat laterally compressed; the metathorax as long as the pro- and mesothorax together; the scutellum large, prominent, flat in the middle above, the metathorax with a rounded slope to the apex and delicately marked with transverse striæ. Wings fusco-hyaline, the posterior pair clear hyaline at base; in the front wing the transverse-medial nervure strikes the externo-medial nervure well before the apex of the 1st submedial cell, in the hind wing the cubital nervure is interstitial with the transverse-anal nervure. Legs black; the intermediate and posterior tibiæ strongly spined and serrated, the long tibial calcaria of the posterior legs about half the length of the metatarsus, the tarsi spinose, claws unidentate below, all the coxæ on the underside with slate-coloured pile. Abdomen black, smooth and shining, with broad bands of slate-coloured pile at the bases of the 2nd, 3rd, 4th, and 5th segments, the apical segment black and studded with long black hairs; below the abdomen is smooth and somewhat shining, with a transverse furrow crossing the 2nd segment.

Pundaloya (*Green coll.*).

Resembles *S. rothneyi*, Cameron, but this is a stouter and more compact insect and has the wings hyaline with two fuscous clouds crossing the fore wing.

220. Salius crinitus (Bingham).

Priocnemis crinitus, Bingh. Jour. Bomb. Nat. Hist. Soc. v. (1890), 238, 7 ♀.

Salius crinitus, Cam. Mem. & Proc. Manch. Lit. & Phil Soc. ser. 4, iv. (1891), 451, 35.

Pundaloya (*Green coll.*).

The male has not previously been described. It closely resembles the female, but is a slenderer insect and is devoid of the long

golden pubescence which clothes the thorax and abdomen in the female. Length 16 millim. Exp. 35 millim.

221. Salius consanguineus (Saussure).

Priocnemis consanguineus, Sauss. Hym. d. Novara-Reise, 62, 2 ♀.
Salius consanguineus, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 451, 32.

222. Salius humbertianus (Saussure).

Priocnemis humbertianus, Sauss. Hym. d. Novara-Reise, 63, 4 ♀ ♂.
Salius humbertianus, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1891), 451, 38.

Family Sphegidæ, Leach.

Genus Ammophila, Kirby.

223. Ammophila lævigata, Smith.

Ammophila lævigata, Smith, Cat. Hym. Ins. B. M. iv. 215, 39 ♀; id. Jour. Linn. Soc. xi. (1867), 359, 4; Sauss. Hym. d. Novara-Reise, 23, 1; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 93, 8.
Pundaloya (*Green coll.*).

224. Ammophila atripes, Smith.

Ammophila atripes, Smith, Ann. & Mag. Nat. Hist. ser. 2, ix. (1852), 46; id. Cat. Hym. Ins. B. M. iv. 217, 43; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. (1863), 23; Smith, Jour. Linn. Soc. xi. (1867), 359, 7; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 93, 1.

225. Ammophila longiventris, Saussure.

Ammophila longiventris, Sauss. Hym. d. Novara-Reise, 24, 3 ♂; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iv. (1889), 93, 9.

226. Ammophila humbertiana, Saussure.

Ammophila humbertiana, Sauss. Hym. d. Novara-Reise, 25, 4 ♀; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 93, 7.

Genus Pelopœus[1], Latreille.

227. Pelopœus javanus, Lepeletier.

Pelopœus javanus, Lepel. Hym. iii. 309, 6 ♀; Smith, Cat. Hym. Ins. B. M. iv. 231, 16; id. Jour. Linn. Soc. xi. (1867),

[1] Kohl has shown (Ann. d. k. k. Naturhist. Hofmus. v. (1890), p. 102) that for this genus Klug's name *Sceliphron* has priority over *Pelopœus*, Latreille; but the latter name is so well known that I am loth to make any alteration.

360, 20; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 101, 7.

Pundaloya (*Green coll.*).

228. PELOPŒUS SPINOLÆ, Lepeletier.

Pelopœus spinolæ, Lepel. Hym. iii. 307, 4; Smith, Cat. Hym. Ins. B. M. iv. 231, 19; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 23; Smith, Jour. Linn. Soc. xi. (1867), 359, 3; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 102, 12.

229. PELOPŒUS VIOLACEUS (Fabricius).

Sphex violaceus, Fabr. Ent. Syst. ii. 201, 12.
Pepsis violaceus, Fabr. Syst. Piez. 211, 16.
Chalybion violaceum, Dahlb. Hym. Eur. i. 21, 1.
Chalybion bengalensis, Dahlb. Hym. Eur. i. 433, 2.
Pelopœus violaceus, Lepel. Hym. iii. 32, 21; Costa, Prosp. d. Imenott. Ital. fasc. i. 21, 6.
Pelopœus flebilis, Lepel. Hym. iii. 321, 22.
Pelopœus bengalensis, Smith, Cat. Hym. Ins. B. M. iv. 320, 15; id. Jour. Linn. Soc. xi. (1867), 360, 19; Smith and Home, Trans. Zool. Soc. vii. (1870), pt. iii. 163, pl. xxi. f. 2, 2*a*; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 101, 2.

Pundaloya (*Green coll.*).

I think there is little doubt that *Chalybion bengalensis* of Dahlbom = *Sphex violaceus*, Fabricius. Typical specimens of *P. violaceus* and *P. bengalensis* may differ in the sculpture of the thorax and in the colour of the wings, but the insect is a variable one.

Genus SPHEX, Linnæus, pt.

230. SPHEX LOBATUS, Fabricius.

Sphex lobatus, Fabr. Syst. Ent. 348 (1775); Kohl, Ann. des k. k. Naturhist. Hofmus. v. 177, 1.
Sphex smaragdinus, Drury, Exot. Ins. iii. 57, pl. 42. f. 2.
Sphex cærulea, Christ (*nec* Drury), Naturg. Ins. 308, t. 30. f. 6.
Sphex chrysis, Christ, Naturg. Ins. 310, t. 30. f. 7; Kohl, Termesz. Füzetek, ix. 173 ♀ ♂; André, Spec. Hym. iii. fasc. 27, 123 ♀ ♂; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 105, 1.
Sphex lobata, Fabr. Ent. Syst. ii. 206, 30.
Chlorion lobatum, Fabr. Syst. Piez. 217, 1; Blanch. Hist. Nat. Anim. Art. iii. 351; Lepel. Hym. iii. 330; Dahlb. Hym. Eur. i. 24 & 435; Smith, Cat. Hym. Ins. B. M. ii. 237, 1; id. Jour. Linn. Soc. xi. (1867), 360, 1.
Chlorion azureum, Blanch. Hist. Nat. Anim. Art. iii. 351, pl. vi. f. 6; Lepel. Hym. iii. 329.

Pundaloya (*Green coll.*).

231. Sphex aurulentus, Fabricius.

Sphex aurulenta, Fabr. Mant. Ins. i. & ii. 274; Ent. Syst. ii. 201, 14; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 107, 12.

Pepsis sericea, Fabr. Syst. Piez. 211, 19.

Sphex sericea, Dahlb. Hym. Eur. i. 26, 7; Lepel. Hym. iii. 341, 12 ♀; Smith, Cat. Hym. Ins. B. M. iv. 255, 62; Jour. Linn. Soc. xi. (1867), 361, 11.

Sphex fabricii, Dahlb. Hym. Eur. i. 27, 11; Smith, Cat. Hym. Ins. B. M. iv. 253, 54; Jour. Linn. Soc. xi. (1867), 361, 3.

Sphex ferruginea, Lepel. Hym. iii. 354, 18; Smith, Cat. Hym. Ins. iv. 253, 55; Jour. Linn. Soc. 361, 4.

Sphex lineola, Lepel. Hym. iii. 353, 27 ♂; Smith, Cat. Hym. Ins. B. M. iv. 254, 58; Jour. Linn. Soc. xi. (1867), 361, 7.

Sphex ferox, Smith, Jour. Linn. Soc. vi. (1862), 55, 5 ♂; id. ibid. xi. (1867), 362, 22.

Sphex lepeleterii, Sauss. Hym. d. Novara-Reise, 40, 8 ♀.

Sphex sericeus, Sauss. Hym. d. Novara-Reise, 41, 11 ♀.

Sphex godeffroyi, Sauss. Stet. ent. Zeit. xxx. (1869), 57 ♀.

Sphex aurifex, Smith, Jott. Cruise Cur. by Brenchley, 460 ♀, t. xliv. f. 3.

Sphex aurulentus, Kohl, Termesz. Füzetek, ix. (1885), 194 ♀ ♂; Ann. d. k. k. Naturhist. Hofmus. v. (1890), 392, 84 ♀ ♂.

Pundaloya, Colombo (*Green coll.*).

232. Sphex fulvo-hirtus, Bingham.

Sphex fulvo-hirta, Bingh. Jour. Bomb. Nat. Hist. Soc. v. (1890), 242, 14 ♀; id. ibid. viii. (1893), 379, 29, pl. i. f. 8.

Pundaloya (*Green coll.*).

233. Sphex umbrosus, Christ.

Sphex umbrosus, Christ, Naturg. Ins. 293, t. xxix. f. 2 ♀ (1791).

Sphex fumicata, Christ, Naturg. Ins. 295, t. xxix. f. 6 ♂ (1791).

Sphex argentata, Fabr. Mant. Ins. i. 274; Ent. Syst. ii. 200, 8; Dahlb. Hym. Eur. i. 25, 1 ♀ ♂; Smith, Cat. Hym. Ins. iv. 252, 52; id. Jour. Linn. Soc. xi. (1867), 361, 1; Taschbg. Zeitschr. f. d. ges. Naturwiss. Halle, xxxiv. (1869), 414; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 107, 10.

Sphex albifrons, Fabr. Ent. Syst. ii. 207, 36; Lepel. Hym. iii. 337, 6 ♂.

Pepsis albifrons, Fabr. Syst. Piez. 212, 27.

Sphex argentifrons, Lepel. Hym. iii. 337, 7 ♀; Kohl, Termesz. Füzetek, ix. (1885), p. 2 *a*, 196 ♀ ♂.

Sphex carbonaria, Smith, Cat. Hym. Ins. B. M. iv. 247, 38 ♀.

Sphex ephippium, Smith, Cat. Hym. Ins. B. M. iv. 249, 45 ♀, pl. vi. f. 3.

Sphex opulenta, Smith, Cat. Hym. Ins. B. M. iv. 250, 46 ♂.

Sphex diabolica, Smith, Jour. Linn. Soc. ii. (1858), 100, 3 ♀; id. ibid. xi. (1867), 361, 12.

Sphex tuberculata, Smith, Ann. & Mag. Nat. Hist. ser. 4, xii. (1873), 291 ♀.

Sphex argentatus, André, Spec. Ins. iii. fasc. 27 ♀ ♂.

Sphex umbrosus, Kohl, Ann. d. k. k. Naturhist. Hofmus. v. (1890), 406, 99.

Pundaloya (*Green coll.*).

234. SPHEX NIGRIPES, Smith.

Sphex nigripes, Smith, Cat. Hym. Ins. B. M. iv. 254, 59 ♀; id. Jour. Linn. Soc. xi. (1867), 361, 8; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 108, 15; Kohl, Ann. d. k. k. Naturhist. Hofmus. v. (1890), 421, 114 ♀ ♂.

Sphex siamensis, Taschenb. Zeitschr. f. d. ges. Naturwiss. Halle, xxxiv. (1869), 413 ♀.

Sphex erythropoda, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 108, 13 & 110 ♀.

Pundaloya (*Green coll.*).

The two specimens in Mr. Green's collection have much darker wings than the type which is in the British Museum, but they agree very well with Mr. Smith's description. Kohl unites *Sphex tyrannica*, Smith, with this species. I have examined the types of both, and they seem to me quite distinct species, markedly in the shape and form of the clypeus, petiole, and abdomen, and in the colour of the wings and legs, as shown in Plate XV. figs. 1 and 3.

235. SPHEX VIDUATUS, Christ.

Sphex fervens, Fabr. (*nec* Linné), Syst. Ent. 346 (1775); Mant. Ins. i. & ii. 275 (1787); Ent. Syst. ii. 200, 5 (1793).

Sphex viduata, Christ, Naturg. Ins. 305, t. xxx. f. 4 (1791).

Sphex pubescens, Fabr. Ent. Syst. ii. 205, 28; Kohl, Termesz. Füzetek, ix. (1885), 188 ♀ ♂; André, Spec. Hym. iii. fasc. 27, 130; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 106, 8.

Pepsis fervens, Fabr. Syst. Piez. 209, 6.

Pepsis pubescens, Fabr. Syst. Piez. 212, 22.

Enodia canescens, Dahlb. Hym. Eur. i. 28, 2.

Enodia fervens, Dahlb. Hym. Eur. i. 439, 2.

Parasphex fervens, Smith, Cat. Hym. Ins. B. M. iv. 267, 1; Jour. Linn. Soc. xi. (1867), 362, 1.

Sphex viduatus, Kohl, Ann. d. k. k. Naturhist. Hofmus. v. (1890), 332, 32.

Colombo.

Being in Colombo for a couple of days, I caught, among other insects, one specimen of this species just outside the Oriental Hotel.

236. SPHEX LUTEIPENNIS, Mocsary.

Sphex luteipennis, Mocs. Magy. Akad. Term. Ertek. (1883),

K. 11, 33 ♀; Kohl, Ann. d. k. k. Naturhist. Hofmus. v. (1890), 433, 115.

Sphex rufipennis, Kohl, Termesz. Füzetek, ix. (1885), 198 ♀ ♂.

Genus AMPULEX, Jurine.

237. AMPULEX COMPRESSA (Fabricius).

Sphex compressa, Fabr. Mant. Ins. i. 275, 25; Ent. Syst. ii. 206, 32.

Chlorion compressum, Fabr. Syst. Piez. 219, 7; Latr. Hist. Nat. Crust. et Ins. xiii. 294; Westw. Trans. Ent. Soc. iii. (1841), 227.

Ampulex compressa, Jur. Hym. 134; Lepel. Hym. iii. 325, 1; Dahlb. Hym. Eur. i. 29, 1; Smith, Cat. Hym. Ins. B. M. iv. 268, 1; id. Jour. Linn. Soc. xi. (1867), 363, 1; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 116, 1.

Pundaloya (*Green coll.*).

Two specimens in Mr. Green's collection are very vivid in colouring.

238. AMPULEX (?) ANNULIPES, Motschoulsky.

Ampulex (?) *annulipes*, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 24; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 117, 5.

Family LARRIDÆ, Leach.

Genus PISON, Spinola.

239. PISON (PARAPISON) AGILE (Smith).

Parapison agile, Smith, Trans. Ent. Soc. (1869), 300, 4; Kohl, Verh. d. k.-k. zool.-bot. Ges. Wien (1884), 186; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 117, 1.

Genus TRYPOXYLON, Latreille.

240. TRYPOXYLON PILEATUM, Smith.

Trypoxylon pileatum, Smith, Cat. Hym. Ins. B. M. iv. 377, 5 ♀; Journ. Linn. Soc. xi. (1867), 368, 1; Kohl, Verh. d. k.-k. zool.-bot. Ges. Wien, 1884, 206; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 119, 11.

Pundaloya (*Green coll.*).

241. TRYPOXYLON INTRUDENS, Smith.

Trypoxylon intrudens, Smith, Trans. Zool. Soc. vii. (1872), 188, 1 ♀; Kohl, Verh. d. k.-k. zool.-bot. Ges. Wien, 1884, 205; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 119, 7.

Genus LARRA, Fabricius.

242. LARRA EXTENSA (Walker).

Larrada extensa, Walk. Ann. & Mag. Nat. Hist. ser. 3 (1860),

305; Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 24.

Larra extensa, Kohl, Verh. d. k.-k. zool.-bot. Ges. Wien, 1884, 243; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 125, 5.

Genus NOTOGONIA, Costa.

243. NOTOGONIA SUBTESSELATA (Smith).

Larrada subtesselata, Smith, Cat. Hym. Ins. B. M. iv. 277, 11 ♀; Jour. Linn. Soc. xi. (1867), 364, 7.

Larra subtesselata, Kohl, Verh. d. k.-k. zool.-bot. Ges. Wien, 1884, 248.

Notogonia subtesselata, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 130, 4.

Pundaloya (*Green coll.*).

244. NOTOGONIA DEPLANATA, Kohl.

Notogonia deplanata, Kohl, Verh. d. k.-k. zool.-bot. Ges. Wien, 1883, 358, 2 ♀; id. ibid. 1884, 75; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 130, 3.

245. NOTOGONIA JACULATOR (Smith).

Larrada jaculator, Smith, Cat. Hym. Ins. B. M. iv. 279, 15 ♀; Jour. Linn. Soc. xi. (1867), 364, 11.

Larra jaculator, Kohl, Verh. d. k.-k. zool.-bot. Ges. Wien, 1884, 244.

Notogonia jaculator, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 129, 2.

Pundaloya (*Green coll.*).

246. NOTOGONIA LABORIOSA (Smith).

Larrada laboriosa, Smith, Cat. Hym. Ins. B. M. iv. 278, 12 ♀; Jour. Linn. Soc. xi. (1867), 364, 8.

Larra laboriosa, Kohl, Verh. zool.-bot. Ges. Wien, 1884, 245; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 125, 6.

Pundaloya (*Green coll.*).

247. NOTOGONIA VIGILANS (Smith).

Larrada vigilans, Smith, Cat. Hym. Ins. B. M. iv. 279, 16 ♀.

Larra vigilans, Kohl, Verh. d. k.-k. zool.-bot. Ges. Wien, 1884, 248.

Pundaloya (*Green coll.*).

Two specimens in Mr. Green's collection agree fairly well with Smith's description, so far as it goes. The insect was originally described from China. It occurs in Sikkim and also in Burma.

248. NOTOGONIA TISIPHONE (Smith).

Larrada tisiphone, Smith, Jour. Linn. Soc. ii. (1858), 103, 5 ♀; id. ibid. xi. (1867), 364, 15.

Larra tisiphone, Kohl, Verh. d. k.-k. zool.-bot. Ges. Wien, 1884, 248; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 125, 10.

Pundaloya (*Green coll.*).

Genus Liris, Fabricius.

249. Liris hæmorrhoidalis (Fabricius).

Pompilus hæmorrhoidalis, Fabr. Syst. Piez. 198, 55.
Lyrops savignyi, Spin. Ann. Soc. Ent. Fr. vii. (1838), 476, 26.
Liris orichalcea, Dahlb. Hym. Eur. i. 135.
Liris savignyi, Dahlb. Hym. Eur. i. 471, 2.
Tachytes illudens, Lepel. Hym. iii. 249, 12.
Larrada hæmorrhoidalis, Smith, Cat. Hym. Ins. B. M. iv. 280, 17.
Liris hæmorrhoidalis, Kohl, Verh. d. k.-k. zool.-bot. Ges. Wien, 1884, 256, 1 ♀ ♂; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 131, 1.

Pundaloya (*Green coll.*).

There are sixteen specimens in Mr. Green's collection, none of them typical; all want the rich golden pubescence on the abdomen, which gives specimens from Western India the wonderful tesselated appearance.

250. Liris auratus (Fabricius).

Sphex aurata, Fabr. Ent. Syst. ii. 213, 64.
Pompilus auratus, Fabr. Ent. Syst. Suppl 250, 25.
Liris aurata, Fabr. Syst. Piez. 228, 3; Dahlb. Hym. Eur. i. 135; Kohl, Verh. d. k.-k. zool.-bot. Ges. Wien, 1884, 241.
Lyrops auratus, Guér. Icon. Règn. Anim. iii. 440.
Tachytes opulenta, Lepel. Hym. iii. 246 ♀ ♂.
Larrada aurulenta, Smith, Cat. Hym. Ins. B. M. iv. 276, 6; Jour. Linn. Soc. xi. (1867), 363, 1.
Liris auratus, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 131, 2.

Pundaloya (*Green coll.*).

251. Liris ducalis (Smith).

Larrada ducalis, Smith, Jour. Linn. Soc. v. (1860), 84, 1 ♀; id. ibid. xi. (1867), 365, 23.
Liris ducalis, Kohl, Verh. d. k.-k. zool.-bot. Ges. Wien, 1884, 243.

Pundaloya (*Green coll.*).
Also found in Burma.

Genus Piagetia, Ritsema.

252. Piagetia fasciatiipennis, Cameron.

Piagetia fasciatiipennis, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 16; id. ibid. p. 134.

Genus PALARUS, Latreille.

253. PALARUS ORIENTALIS, Kohl.

Palarus orientalis, Kohl, Verh. d. k.-k. zool.-bot. Ges. Wien, 1884, 422, 2 ♂ ; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889), 148, 1.

Family NYSSONIDÆ, Wesmael.

Genus STIZUS, Latreille.

254. STIZUS PRISMATICUS (Smith).

Larra prismatica, Smith, Jour. Linn. Soc. ii. (1858), 103, 1 ♀ ♂; id. ibid. xi. (1867), 367, 10.

Stizus prismaticus, Sich. Hym. d. Novara-Reise, 142; Handl. Sitzungsb. d. k. Akad. d. Wissensch. Wien, 1892, 55, 21.

Pundaloya (*Green coll.*).

Genus GORYTES, Latreille.

255. GORYTES GREENII, sp. nov. (Plate XV. fig. 8.)

♀. L. 14 millim. Exp. 32 millim.

Brownish red variegated with yellow; wings flavo-hyaline, the fore wing with a large dark brown macula on the costal margin at the apex.

Head not so broad as the thorax, smooth, or with only a few scattered punctures, covered with a thin sericeous golden pile only seen in certain lights; mandibles yellow, ferruginous at apex; clypeus light brownish red, transversely oval and convex; antennæ brown above, fulvous red below; the scape in front and an abbreviated line on the inner margin of the eyes yellow; front slightly concave; the ocelli in a broad triangle on the vertex, a shallow furrow from the anterior ocellus to a little above the antennæ. Thorax brown; prothorax smooth and shining, its posterior margin broadly yellow; mesothorax above very finely longitudinally striated, carrying two short parallel carinæ on the disc anteriorly; scutellum, postscutellum, and the sides of the thorax somewhat coarsely striated, a broad fascia on the scutellum, a narrower one on the postscutellum, and a spot under the base of the wings yellow; metathorax posteriorly rounded, roughly reticulated, the triangular enclosed space at its base longitudinally striate. Wings yellowish hyaline and iridescent; the front wing with a large dark brown spot occupying the whole of the radial cell, and extending below into the 2nd and 3rd cubital cells; the 2nd cubital cell, receiving both recurrent nervures, is at base about two-thirds the length of the 3rd cubital cell; the 1st and 3rd cubital cells subequal; tegulæ and stigma testaceous, nervures brown. Legs reddish brown, paler on the underside. Abdomen petiolated, brown, smooth and shining, a broad yellow fascia on the posterior margin of the 2nd and 5th segments above; the base and apex of the

petiole and the posterior margins of the 3rd and 4th segments light red; underneath the abdomen is brown, with the posterior margins of all the segments reddish.

Pundaloya (*Green coll.*).

This large and well-marked species I have ventured to name after Mr. Green. It is not closely allied to any species of *Gorytes* known to me. At the time of capture of the type she was carrying off a Homopterous insect with which to store her nest.

Genus Bembex, Fabricius.

256. Bembex sulphurescens, Dahlbom.

Bembex sulphurescens, Dahlb. Hym. Eur. i. 180, and 491, 24; Smith, Cat. Hym. Ins. B. M. iv. 328, 46; id. Jour. Linn. Soc. xi. (1867), 366, 3; Sich. Hym. d. Novara-Reise, 141; Handlirsch, Sitz. d. k. Akad. d. Wissensch. Wien, 1893, 897, 137.

257. Bembex trepanda, Dahlbom.

Bembex trepanda, Dahlb. Hym. Eur. i. 181, and 490, 23; Smith, Cat. Hym. Ins. B. M. iv. 328, 45; id. Jour. Linn. Soc. xi. (1867), 366, 2; Sich. Hym. d. Novara-Reise, 141; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iii. (1890), 247, 2; Handlirsch, Sitz. d. k. Akad. d. Wissensch. Wien, 1893, 736, 19.

Pundaloya (*Green coll.*).

258. Bembex indica, Handlirsch.

? *Bembex glauca*, Fabr. Mant. Ins. i. 285, 5; Oliv. Encycl. Méthod. iv. 291, 6 ♀; Fabr. Ent. Syst. ii. 249 ♀; Syst. Piez. 224, 8; Dahlb. Hym. Eur. i. 491 ♀ ♂.

Bembex indica, Handlirsch, Sitz. d. k. Akad. d. Wissensch. Wien, 1893, 771, 39.

259. Bembex borrei, Handlirsch.

Bembex borrei, Handlirsch, Sitz. d. k. Akad. d. Wissensch. Wien, 1893, 866, 102.

Family Cerceridæ, Wesmael.

Genus Cerceris, Latreille.

260. Cerceris novaræ, Saussure.

Cerceris novaræ, Sauss. Hym. d. Novara-Reise, 92, 9 ♀ (1867), pl. iv. f. 54; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iii. (1890), 249, 14 & 257.

? *Cerceris fervens*, Smith, Ann. & Mag. Nat. Hist. ser. 4, xii. (1873), 411; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iii. (1890), 249, 6 & 256.

Pundaloya (*Green coll.*).

One specimen, a male, in Mr. Green's collection has the yellow bands on the abdominal segments very narrow, and interrupted in the middle above.

261. CERCERIS INSTABILIS, Smith.

Cerceris instabilis, Smith, Cat. Hym. Ins. B. M. iv. 452, 74 ♂ ♀; id. Jour. Linn. Soc. 370, 6; Sauss. Hym. d. Novara-Reise, 92, 10; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iii. (1890), 249, 11.

Cerceris velox, Smith, Trans. Ent. Soc. 1875, 41 ♂.

This species occurs abundantly in Burma and Sikkim. From Ceylon, it is recorded by de Saussure.

262. CERCERIS HUMBERTIANA, Saussure.

Cerceris humbertiana, Sauss. Hym. d. Novara-Reise, 97, 4 ♀; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iii. (1890), 249, 10.

Cerceris rufinodis, Smith, Trans. Ent. Soc. 1875, 41.

Cerceris viscosus, Smith, Trans. Ent. Soc. 1875, 40.

263. CERCERIS EMORTUALIS, Saussure.

Cerceris emortualis, Sauss. Hym. d. Novara-Reise, 98, 20; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iii. (1890), 248, 4.

Cameron considers this species as a variety only of *C. humbertiana*.

Genus PHILANTHUS, Fabricius.

264. PHILANTHUS BASALIS, Smith.

Philanthus basalis, Smith, Cat. Hym. Ins. B. M. iv. 473, 17 ♀; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 23; Smith, Jour. Linn. Soc. xi. (1867), 371, 5; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iii. (1890), 248, 6.

Family CRABRONIDÆ, Leach.

Genus CRABRO, Fabricius.

265. CRABRO PALITANS, sp. nov. (Plate XV. fig. 6.)

♀. L. 11 millim. Exp. 18 millim.

Black variegated with yellow, the wings hyaline, fore wing yellowish brown along the costal margin.

Head black, broad, quadrate, the mandibles with a yellow stain on their outer side, the clypeus covered with dense golden pile, more than twice as broad as high, a short perpendicular carina down its middle, its anterior margin waved; the antennæ with the scape yellow in front, the flagellum piceous; the face up to the ocelli closely punctured and covered with golden pile; the vertex, the back of the head, and behind the eyes smooth and shining, with a narrow fringe of golden pile along the orbits. Thorax black; a line on the posterior margin of the prothorax, interrupted in the middle, a spot on the propleuræ, a long triangular mark on the mesopleuræ, the scutellum, a spot on the

tegulæ, and a line on the postscutellum posteriorly, yellow; the prothorax anteriorly smooth and shining, the mesothorax above closely and finely punctured, and the metathorax posteriorly rounded and rather closely and coarsely punctured, the punctures running into oblique divergent striæ; the wings hyaline, the front wing brownish yellow along the costal margin. Legs black, the anterior and intermediate femora and tibiæ marked with yellow on the outside, the posterior tibiæ yellow, black at the base; the tarsi piceous. The abdomen sub-petiolate, broadly oval, black, smooth and shining; the basal segment and the base of the 2nd segment above finely punctured, the 2nd to the 5th segments with lateral yellow maculæ at their bases, the apical segment and the abdomen beneath black.

Pundaloya (*Green coll.*).

This species is closely allied to *C. fuscipennis*, Lepeletier, but is abundantly distinct in size, in colour of the wings, and in the markings.

Genus DASYPROCTUS, Lepeletier.

266. DASYPROCTUS CEYLONICUS, Saussure.

Dasyproctus ceylonicus, Sauss. Hym. d. Novara-Reise, 85 ♀, tab. iv. f. 51; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iii. (1890), 275, 1.

Recorded by de Saussure from Ceylon, occurs also in Sikkim and Burma.

Genus OXYBELUS, Latreille.

267. OXYBELUS INSULARIS, Kohl.

Oxybelus insularis, Kohl, Termesz. Füzetek, viii. (1884), 109 ♀; Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iii. (1890), 276, 7.

268. OXYBELUS LEWISI, Cameron.

Oxybelus lewisi, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, iii. (1890), 282.

Genus STIGMUS, Jurine.

269. STIGMUS NIGER, Motschulsky.

Stigmus niger, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 23.

Pundaloya (*Green coll.*).

This species is very close to the ordinary *S. pendulus*, Panz., found in Europe.

270. STIGMUS CONGRUENS, Walker.

Stigmus congruens, Walk. Ann. & Mag. Nat. Hist. ser. 3, v. (1860), 304; Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 23.

Family VESPIDÆ, Stephen.

Genus LABUS, Saussure.

271. LABUS HUMBERTIANUS, Saussure.

Labus humbertianus, Sauss. Hym. d. Novara-Reise, 4, 2 ♀ ♂.

Genus ZETHUS, Fabricius.

272. ZETHUS CEYLONICUS, Saussure.

Zethus ceylonicus, Sauss. Hym. d. Novara-Reise, 5, 1 ♀.

Genus EUMENES, Latreille.

273. EUMENES PETIOLATA (Fabricius).

Vespa petiolata, Fabr. Sp. Ins. i. 467; Mant. Ins. i. 292; Ent. Syst. ii. 278, 37; Oliv. Encycl. Méth. ii. 670.

Eumenes petiolata, Fabr. Syst. Piez. 284; Latr. Hist. Nat. Ins. iii. 360; Westw. Ins. India, 90, t. 5. f. 2.

Eumenes petiolatus, Sauss. Mon. Guêpes Sol. 47, 28.

Pundaloya (*Green coll.*).

274. EUMENES FLAVOPICTA, Blanchard.

Eumenes flavopicta, Blanch. Dict. d'Hist. Nat de Ch. d'Orb. Ins. Hym. pl. ii. f. 2; Sauss. Mon. Guêpes Sol. 65, 52 ♀; Smith, Cat. Hym. Ins. B. M. v. 22, 18; id. Jour. Linn. Soc. xi. (1867), 371, 7.

Eumenes arcuata, Westw. Ins. Ind. 90, t. 57. f. 3.

Pundaloya (*Green coll.*).

275. EUMENES HUMBERTIANUS, Saussure.

Eumenes humbertianus, Sauss. Hym. d. Novara-Reise, 6, 2 ♀ ♂.

Pundaloya (*Green coll.*).

Genus RHYNCHIUM, Spinola.

276. RHYNCHIUM CARNATICUM (Fabricius).

Vespa carnatica, Fabr. Ent. Syst. Suppl. 261, 21; Syst. Piez. 258, 22.

Rygchium carnaticum, Sauss. Mon. Guêpes Sol. 112, 17.

Rhynchium carnaticum, Smith, Cat. Hym. Ins. B. M. v. 44, 8; Jour. Linn. Soc. xi. (1867), 374, 6.

Pundaloya (*Green coll.*).

277. RHYNCHIUM METALLICUM (Saussure).

Rygchium metallicum, Sauss. Mon. Guêpes Sol. 114, 21 ♀ ♂.

Rhynchium metallicum, Smith, Cat. Hym. Ins. B. M. v. 45, 9; Jour. Linn. Soc. xi. (1867), 375, 7.

Pundaloya (*Green coll.*).

Genus Odynerus, Latreille.

278. Odynerus ovalis, Saussure.

Odynerus ovalis, Sauss. Mon. Guêpes Sol. 215, 122 ♂ ; Smith, Cat. Hym. Ins. B. M. v. 59, 58 ; Jour. Linn. Soc. xi. (1867), 376, 4.
Pundaloya (*Green coll.*).

279. Odynerus humbertianus, Saussure.

Odynerus humbertianus, Sauss. Hym. d. Novara-Reise, 13, 11 ♀ ♂.
Pundaloya (*Green coll.*).

280. Odynerus ceylonicus, Saussure.

Odynerus ceylonicus, Sauss. Hym. d. Novara-Reise, 12, 10 ♀ ♂.

281. Odynerus fistulosus, Saussure.

Odynerus fistulosus, Sauss. Hym. d. Novara-Reise, 11, 7 ♀.
Pundaloya (*Green coll.*).

282. Odynerus sichelii, Saussure.

Odynerus sichelii, Sauss. Mon. Guêpes Sol., Suppl. 206, 94 ♀ ; Smith, Cat. Hym. Ins. B. M. v. 58, 55 ; id. Jour. Linn. Soc. xi. (1867), 375, 1 ; Sauss. Hym. d. Novara-Reise, 8, 1 ♀ ♂.

283. Odynerus tinctipennis, Walker.

Odynerus tinctipennis, Walk. Ann. & Mag. Nat. Hist. ser. 3, v. (1860), 304.
Ancistocerus tinctipennis, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 23.

284. Odynerus intendens, Walker.

Odynerus intendens, Walk. Ann. & Mag. Nat. Hist. ser. 3, v. (1860), 304.
Ancistocerus intendens, Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 23.

Genus Ischnogaster, Guérin.

285. Ischnogaster eximius, Bingham.

Ischnogaster eximius, Bingh. Jour. Bomb. Nat. Hist. Soc. v. (1890), 244, 17 ♂.
Pundaloya (*Green coll.*).

Genus Vespa, Linnæus.

286. Vespa cincta, Fabricius.

Vespa cincta, Fabr. Syst. Ent. x. 362, 1 ; Spec. Ins. 458, 1 ; Mant. Ins. i. 287, 1 ; Ent. Syst. ii. 254, 6 ; Syst. Piez. 253, 1 ; Lepel. Hym. i. 505, 1 ; Sauss. Mon. Guêpes Soc. 152, 37 ☿ ; Smith, Cat. Hym. Ins. B. M. v. 118, 12 ; Jour. Linn. Soc. xi. (1867), 382, 2.

Sphex tropica, Sulz. Die Kenn. d. Insect. t. 27. f. 5.
Vespa unifasciata, Oliv. Encycl. Méth. vi. 677, 39.
Vespa tenebrionis, Christ, Hym. 216.
Pundaloya (*Green coll.*).
The remarks in Tennent's 'Natural History of Ceylon,' ch. xii. p. 417, evidently refer to this insect, and not to *Sphex ferruginea*, Lepel. = *aurulentus*, Fabr.

287. VESPA OBLITERATA, Smith.

Vespa obliterata, Smith, Trans. Ent. Soc. new ser. ii. (1852–53), 47; Saussure, Mon. Guêpes Soc. 149, 32 ♀; Smith, Cat. Hym. Ins. B. M. v. 119, 18; Jour. Linn. Soc. xi. (1867), 383, 8.
Pundaloya (*Green coll.*).

Genus POLISTES, Latreille.

288. POLISTES STIGMA, Fabricius.

Vespa stigma, Fabr. Ent. Syst. ii. 275, 78.
Vespa tamula, Fabr. Ent. Syst. Suppl. 263, 78.
Polistes stigma, Fabr. Syst. Piez. 261, 41; Sauss. Mon. Guêpes Soc. 64, 21 ♀; Smith, Cat. Hym. Ins. B. M. v. 102, 9; Jour. Linn. Soc. xi. (1867), 381, 5.
Polistes tamula, Fabr. Syst. Piez. 274, 27.
Pundaloya (*Green coll.*).

Genus ICARIA, Saussure.

289. ICARIA FERRUGINEA, Fabricius.

Vespa ferruginea, Fabr. Ent. Syst. ii. 280, 95.
Polistes ferruginea, Fabr. Syst. Piez. 277, 39.
Icaria ferruginea, Sauss. Mon. Guêpes Soc. 38, 17 ♀ ☿, pl. v. f. 6; Smith, Cat. Hym. Ins. B. M. v. 97, 20; Jour. Linn. Soc. xi. (1867), 378, 2.
Pundaloya (*Green coll.*).

290. ICARIA MARGINATA, Lepeletier.

Epipona marginata, Lepel. Hym. i. 541, 3 ☿ ♂.
Icaria ferruginea, Sauss. (nec Fabr.), Mon. Guêpes Soc. 38, 17 (var.).
Icaria marginata, Sauss. Mon. Guêpes Soc. App. 237 ☿; Smith, Cat. Hym. Ins. B. M. v. 97, 21.
Pundaloya (*Green coll.*).

Family ANDRENIDÆ, Leach.

Genus PROSOPIS, Fabricius.

291. PROSOPIS MONILICORNIS, Motschulsky.

Prosopis monilicornis, Motsch. Bull. Soc. Imp. d. Nat. Mosc. (1863), 24, 245; Smith, Jour. Linn. Soc. xi. (1867), 385, 6.

Genus Nomia, Latreille.

292. Nomia capitata, Smith.

Nomia capitata, Smith, Trans. Ent. Soc. 1875, 54, 1 ♂.
Pundaloya (*Green coll.*).

293. Nomia carinata, Smith.

Nomia carinata, Smith, Trans. Ent. Soc. 1875, 57, 8 ♀.

294. Nomia chalybeata, Smith.

Nomia chalybeata, Smith, Trans. Ent. Soc. 1875, 59, 14 ♀ ♂, pl. ii. f. 5 ♂.
Pundaloya (*Green coll.*).

295. Nomia quadridentata, Smith.

Nomia quadridentata, Smith, Trans. Ent. Soc. 1875, 58, 11 ♀ ♂, pl. ii. f. 6 ♂.
Pundaloya (*Green coll.*).

296. Nomia rustica, Westwood.

Nomia rustica, Westw. apud Smith, Cat. Hym. Ins. B. M. i. 90, 21 ♂; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25.

297. Nomia vincta, Walker.

Nomia vincta, Walk. Ann. & Mag. Nat. Hist. ser. 3, v. (1860), 305; Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25.

Genus Halictus, Latreille.

298. Halictus agrestis, Smith.

Halictus agrestis, Smith, Cat. Hym. Ins. B. M. i. 61, 72 ♀; Jour. Linn. Soc. xi. (1867), 386, 2.
Pundaloya (*Green coll.*).

299. Halictus amœnus, sp. nov.

♀. L. 8 millim. Exp. 14 millim.

Black, the head, thorax in front, and the basal segment of the abdomen piceous; wings sordid hyaline; legs with glistening fulvous pubescence, the tarsi light testaceous.

The head finely and closely punctured, and covered with a thin fulvous pubescence; the clypeus broad, its anterior margin fringed with long fulvous hairs and marked with a few deep coarse punctures, the space above it convex, from which a short perpendicular carina runs up between the base of the antennæ; the front of the face subconcave; the ocelli in a broad triangle on the vertex; the antennæ piceous, lighter on the scape in front. Thorax, the mesothorax above broad, convex, finely and closely

punctured, an abbreviated longitudinally impressed line on either side on the disc close to the tegulæ; the scutellum raised and prominent; the postscutellum with close short fulvous pubescence; the metathorax opaque black, thinly pubescent, flattened laterally, with the apex abruptly truncated, an enclosed triangular space at its base subconcave and closely punctured. The wings sordid hyaline, the tegulæ and nervures testaceous brown. Legs testaceous brown, covered with a glistening fulvous pubescence; the tarsi light testaceous. Abdomen black, the basal segment above piceous, very smooth and shining; the remaining segments finely and closely punctured at their base, their posterior margins smooth, shining, and narrowly testaceous. Beneath the abdomen is black and thinly pubescent.

Pundaloya (*Green coll.*).

Described from four specimens in my own collection, from Sikkim and Tenasserim, and two specimens in Mr. Green's collection. It is nearest to, but perfectly distinct from, the recently-described *H. amitinus*, Vachal, from the Karen Hills, in Burma. From this species it differs in the sculpture and shape of the metathorax, and in wanting the pubescent white bands on the abdomen.

300. HALICTUS VERNALIS, Smith.

Halictus vernalis, Smith, Desc. New Spec. Hym. B. M. 30, 2 ♀.

301. HALICTUS TIMIDUS, Smith.

Halictus timidus, Smith, Desc. New Spec. Hym. B. M. 31, 3 ♀.

Genus ANDRENA, Fabricius.

302. ANDRENA EXAGENS, Walker.

Andrena exagens, Walk. Ann. & Mag. Nat. Hist. ser. 3, v. (1860), 305; Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25.

Family APIDÆ, Leach.

Genus MEGACHILE, Latreille.

303. MEGACHILE LANATA, Fabricius.

Apis lanata, Fabr. Ent. Syst. ii. 335, 90.

Anthophora lanata, Fabr. Syst. Piez. 372, 1.

Megachile lanata, Lepel. Hym. ii. 342, 16 ♀; Smith, Cat. Hym. Ins. B. M. i. 177, 97; Jour. Linn. Soc. xi. (1867), 387, 1.

Pundaloya (*Green coll.*).

304. MEGACHILE CONJUNCTA, Smith.

Megachile conjuncta, Smith, Cat. Hym. Ins. B. M. i. 175, 90 ♂ ♀; Jour. Linn. Soc. xi. (1867), 388, 19.

Pundaloya (*Green coll.*).

305. MEGACHILE ARDENS, Smith.

Megachile ardens, Smith, Desc. New Spec. Hym. B. M. 67, 19 ♀.

Pundaloya (*Green coll.*).

306. MEGACHILE CEYLONICA, sp. nov. (Plate XV. fig. 9.)

♂. L. 11 millim. Exp. 18 millim.

Black, the face, thorax below, and legs with white pubescence, the pubescence on the thorax above and the fimbria on the abdominal segments ochraceous. Head very broad, closely and finely punctured; mandibles large, black, channelled and coarsely punctured in front; ocelli prominent, placed in a curve on the vertex; clypeus covered with thick white pubescence. Thorax piceous black, finely and closely punctured, covered with a thin ochraceous pubescence; wings brownish hyaline, darker along their costal margins; legs stout, black, thickly fringed below with long white pubescence, claws bifid at the tip. Abdomen black, the margins of all but the two apical segments with narrow bands of ochraceous pubescence widening somewhat at the sides, the two apical segments shining, closely and very finely punctured, the extreme apex notched.

Pundaloya (*Green coll.*).

This species may be the male of *M. ardens*, Smith, but it differs considerably in form and in the colour of the pubescence. It resembles *M. laticeps*, Smith, but differs in the colour of the pubescence on the head and face, which is white, not golden-yellow.

Genus LITHURGUS, Latreille.

307. LITHURGUS ATRATUS, Smith.

Lithurgus atratus, Smith, Cat. Hym. Ins. B. M. i. 145, 7 ♀; Jour. Linn. Soc. xi. (1867), 390, 1.

Pundaloya (*Green coll.*).

Genus CROCISA, Jurine.

308. CROCISA SCUTELLARIS, Fabricius.

Nomada scutellaris, Fabr. Ent. Syst. ii. 346, 2.
Melecta scutellaris, Fabr. Syst. Piez. 387, 4.
Crocisa histrionica, Latr. Gen. Crust. Ins. iv. 172.
Crocisa scutellaris, Lepel. Hym. ii. 453, 7 ♀; Smith, Cat. Hym. Ins. B. M. ii. 276, 2.

309. CROCISA RAMOSA, Lepeletier.

Crocisa ramosa, Lepel. Hym. ii. 451, 5 ♀ ♂; Smith, Cat. Hym. Ins. B. M. ii. 277, 7; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25.

Pundaloya (*Green coll.*).

310. CROCISA EMARGINATA, Lepeletier.

Crocisa emarginata, Lepel. Hym. ii. 449, 3 ♀ ♂; Smith, Cat. Hym. Ins. B. M. ii. 277, 5; Jour. Linn. Soc. xi. (1867), 390, 3.
Pundaloya (*Green coll.*).

Genus ALLODAPE, Lepeletier.

311. ALLODAPE MARGINATA, Smith.

Allodape marginata, Smith, Cat. Hym. Ins. B. M. ii. 230, 7 ♀; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25; Smith, Jour. Linn. Soc. xi. (1867), 390, 1.

Genus CŒLIOXYS, Latreille.

312. CŒLIOXYS CAPITATA, Smith.

Cœlioxys capitata, Smith, Cat. Hym. Ins. B. M. ii. 267, 34 ♀ ♂; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25.

313. CŒLIOXYS CONFUSUS, Smith.

Cœlioxys confusus, Smith, Trans. Ent. Soc. 1875, 50 ♀.
Pundaloya (*Green coll.*).

Genus STELIS, Panz.

314. STELIS CARBONARIA, Smith.

Stelis carbonaria, Smith, Cat. Hym. Ins. B. M. ii. 275, 9 ♀ ♂; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25.

Genus CERATINA, Latreille.

315. CERATINA VIRIDIS, Guérin.

Ceratina viridis, Guér. Icon. Règ. Anim. 444, t. 73. f. 6; Smith, Cat. Hym. Ins. B. M. ii. 224, 9; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25; Smith, Jour. Linn. Soc. xi. (1867), 391, 1.
Pundaloya (*Green coll.*).

316. CERATINA PICTA, Smith.

Ceratina picta, Smith, Cat. Hym. Ins. B. M. ii. 224, 10 ♀; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25; Smith, Jour. Linn. Soc. xi. (1867), 391, 2.

317. CERATINA SIMILLIMA, Smith.

Ceratina similima, Smith, Cat. Hym. Ins. B. M. ii. 225, 11 ♂; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc.

Imp. d. Nat. Mosc. 1863, 25; Smith, Jour. Linn. Soc. xi. (1867), 381, 3.

Genus NOMADA, Fabricius.

318. NOMADA LUSCA, Smith.

Nomada lusca, Smith, Cat. Hym. Ins. B. M. ii. 243, 58 ♀; Jour. Linn. Soc. xi. 391, 2.

Pundaloya (*Green coll.*).

Originally described by Smith from the Philippine Islands, this species occurs also in Burma and Sikkim. It is a somewhat variable insect, and Smith's description is insufficient. I have, however, examined the type in the British Museum, with which the Burmese specimens agree exactly; the Ceylon and Sikkim specimens are darker, and the former has a dull yellow spot on each side, at the base of the 2nd abdominal segment. In Sikkim specimens these two spots coalesce above and form an obscure band at the base of the segment.

Genus ANTHOPHORA, Latreille.

319. ANTHOPHORA ZONATA (Linnæus).

Apis zonata, Linn. Syst. Nat. i. 955.
Andrena zonata, Fabr. Ent. Syst. ii. 311, 19.
Mejilla zonata, Fabr. Syst. Piez. 331, 13.
Anthophora zonata, Lepel. Hym. ii. 25, 1; Smith, Cat. Hym. Ins. B. M. ii. 336, 90; id. Jour. Linn. Soc. xi. (1867), 392, 1; Sich. Suppl. Hym. Novara Reise, 153.

Pundaloya (*Green coll.*).

320. ANTHOPHORA VIOLACEA, Lepeletier.

Anthophora violacea, Lepel. Hym. ii. 80, 47; Smith, Cat. Hym. Ins. B. M. ii. 338, 96.

Pundaloya (*Green coll.*).

321. ANTHOPHORA CINGULATA (Fabricius).

Andrena cingulata, Fabr. Ent. Syst. ii. 314, 30 ♀.
Megilla cingulata, Fabr. Syst. Piez. 332, 18.
Anthophora cingulata, Lepel. Hym. ii. 46 ♀; Sich. Suppl. Hym. d. Novara Reise, 153.

322. ANTHOPHORA FALLAX, Smith.

Anthophora fallax, Smith, Desc. New Spec. Hym. B. M. 120, 3 ♂.

Pundaloya (*Green coll.*).

Only one specimen in Mr. Green's collection, which is not quite typical, as it wants the fulvous fasciæ on the underside of the abdomen. Originally described from Natal, it is a wide-spread species, occurring throughout India.

323. ANTHOPHORA INSULARIS, Smith.

Anthophora insularis, Smith, Jour. Linn. Soc. ii. (1858), 48, 2 ♀; id. ibid. xi. (1867), 392, 7.

Pundaloya (*Green coll.*).

Originally described from Borneo, this species is common in Burma and in Sikkim. *A. vigilans*, described three years later by Mr. Smith from the Celebes, seems to me only a large form of *A. insularis*.

Genus XYLOCAPA, Latreille.

324. XYLOCAPA LATIPES (Drury).

Apis latipes, Drury, Ill. Exot. Ins. ii. 98, t. 48. f. 2 ♂; Fabr. Ent. Syst. ii. 314, 1 ♀.

Apis gigas, Degeer, Mém. Hist. Ins. iii. 576, pl. 28. f. 15.

Xylocapa latipes, Fabr. Syst. Piez. 337, 1; Lepel. Hym. ii. 203, 51 ♀ ♂; Smith, Cat. Hym. Ins. B. M. ii. 353, 43; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25; Smith, Jour. Linn. Soc. xi. (1867), 392, 1; Trans. Ent. Soc. 1874, 267, 40.

325. XYLOCAPA TENUISCAPA, Westwood.

Xylocapa tenuiscapa, Westw. Nat. Libr. xxxviii. 271, t. 23. f. 2 ♂; Smith, Cat. Hym. Ins. B. M. ii. 353, 41; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25; Smith, Jour. Linn. Soc. xi. (1867), 393, 6; Trans. Ent. Soc. 1874, 268, 41.

Xylocapa latreillii, Lepel. Hym. ii. 206, 55 ♀ ♂.

Xylocapa viridipennis, Lepel. Hym. ii. 205, 54 ♀ var.

Pundaloya (*Green coll.*).

326. XYLOCAPA FENESTRATA (Fabricius).

Apis fenestrata, Fabr. Ent. Syst. Suppl. 273, 3 ♀.

Xylocapa fenestrata, Fabr. Syst. Piez. 339, 6; Lepel. Hym. ii. 184, 15 ♀ ♂; Smith, Cat. Hym. Ins. B. M. ii. 353, 46; Jour. Linn. Soc. xi. (1867), 393, 10; Trans. Ent. Soc. 1874, 269, 44 ♀ ♂.

Xylocapa indica, Klug, Mag. d. Gesell. naturf. Freunde zu Berlin (1807), 264.

Pundaloya (*Green coll.*).

327. XYLOCAPA COLLARIS, Lepeletier.

Xylocapa collaris, Lepel. Hym. ii. 189, 26 ♀; Smith, Cat. Hym. Ins. B. M. ii. 353, 47; Jour. Linn. Soc. xi. 393, 11; Trans. Ent. Soc. 1874, 270, 46 ♀ ♂.

Xylocapa dejeanii, Lepel. Hym. ii. 209, 59 ♀; Smith, Cat. Hym. Ins. B. M. ii. 357, 62; Jour. Linn. Soc. xi. 394, 21.

Pundaloya (*Green coll.*).

328. Xylocapa albo-fasciata, Sichel.

Xylocapa albo-fasciata, Sich. Suppl. Hym. d. Novara-Reise, 154 ♀; Smith, Trans. Ent. Soc. 1874, 268, 42.

329. Xylocapa ignita, Smith.

Xylocapa ignita, Smith, Trans. Ent. Soc. 1874, 276, 62 ♀.
Pundaloya (*Green coll.*).

330. Xylocapa nigrocærulea, Smith.

Xylocapa nigrocærulea, Smith, Trans. Ent. Soc. 1874, 279, 70 ♀.
Pundaloya (*Green coll.*).
One specimen which with some doubt I refer to this species; it agrees fairly well with Smith's description, so far as this goes.

331. Xylocapa bryorum (Fabricius).

Apis bryorum, Fabr. Ent. Syst. ii. 321, 28 ♂.
Bombus bryorum, Fabr. Syst. Piez. 348, 28.
Xylocapa dimidiata, Lepel. Hym. ii. 199, 44 ♀; Smith, Cat. Hym. Ins. B. M. ii. 357, 66; Jour. Linn. Soc. xi. (1867), 394, 25.
Xylocapa bryorum, Smith, Trans. Ent. Soc. 1874, 275, 59 ♀ ♂.
Pundaloya (*Green coll.*).

332. Xylocapa dissimilis, Lepeletier.

Xylocapa dissimilis, Lepel. Hym. ii. 180, 9 ♀ ♂; Smith, Cat. Hym. Ins. B. M. ii. 356, 58; Sich. Suppl. Hym. Novara-Reise, 155; Smith, Jour. Linn. Soc. xi. (1867), 394, 19; Trans. Ent. Soc. 1874, 268, 43 ♀ ♂.
Xylocapa lunulata, Lepel. Hym. ii. 184, 14 ♂ var.

Genus Apis, auctorum.

333. Apis dorsata, Fabricius.

Apis dorsata, Fabr. Ent. Syst. ii. 328, 64; Syst. Piez. 370, 7; Lepel. Hym. i. 405, 9 ♀; Smith, Cat. Hym. Ins. B. M. ii. 415, 5; Jour. Linn. Soc. xi. (1867), 396, 1.
Apis nigripennis, Latr. Ann. Mus. Hist. Nat. v. (x.) 170, 4, t. 13. f. 7.
Apis bicolor, Klug, Mag. d. Gesell. naturf. Freunde zu Berlin, 1807, 264, t. 7. f. 3.
Apis zonata, Guér. (*nec* Linn.), Bélang. Voy. Ind. Orient. 504, pl. 4. f. 6.
Apis testacea, Smith, Jour. Linn. Soc. ii. (1858), 49, 5 (immature).
Pundaloya (*Green coll.*).

334. Apis indica, Fabricius.

Apis indica, Fabr. Ent. Syst. Suppl. 274, 59; Syst. Piez. 370 4; Lepel. Hym. i. 403, 5 ☿; Smith, Cat. Hym. Ins. B. M. ii.

416, 7; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25; Smith, Jour. Linn. Soc. xi. (1867), 396, 4.

Apis peronii, Latr. Ann. Mus. Hist. Nat. v. (x.), 173.
Apis socialis, Latr. Ann. Mus. Hist. Nat. v. (x.), 172.
Apis delessertii, Guér. Icon. Règ. Anim. 461.
Apis perottetii, Guér. Icon. Règ. Anim. 461.

Pundaloya (*Green coll.*); Trincomalee (*Yerbury coll.*).

335. APIS FLORALIS, Fabricius.

Apis floralis, Fabr. Syst. Piez. 373, 6; Smith, Jour. Linn. Soc. xi. (1867), 396, 6.
Apis andreniformis, Smith, Jour. Linn. Soc. ii. (1858), 49, 4 ☿.
Apis lobata, Smith, Cat. Hym. Ins. B. M. ii. 416, 10 ♂.

Pundaloya (*Green coll.*).

Genus TRIGONA, Jurine.

336. TRIGONA IRIDIPENNIS, Smith.

Trigona iridipennis, Smith, Cat. Hym. Ins. B. M. ii. 413, 42 ☿; Walk. Tenn. Nat. Hist. Ceylon, ch. xii. 454; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25.

337. TRIGONA PRÆTERITA, Walker.

Trigona prœterita, Walk. Ann. & Mag. Nat. Hist. ser. 3, v. (1860), 305; Motsch. Bull. Soc. Imp. d. Nat. Mosc. 1863, 25.

Family CHRYSIDIDÆ, Leach.

Genus STILBUM, Spinola.

338. STILBUM CYANURUM (Forster).

Chrysis cyanura, Forst. Nov. Spec. Ins. 89 (1771).
Chrysis nobilis, Fuesl. Mag. d. Ent. i. 222.
Stilbum splendidum, Blanch. (*nec* Fabr.) Hist. Nat. iii. 297, 2, t. iii. f. 3; Brullé, Hym. iv. 15, 1; Smith, Trans. Ent. Soc. 1874, 469 ♀ ♂.
Chrysis splendida, Fabr. Syst. Ent. 357, 1 (1775); Spec. Ins. 1, 454; Mant. Ins. i. 282, 1; Ent. Syst. ii. 238, 1; Syst. Piez. 170, 1.
Chrysis spinolæ, Montr. Ann. Soc. Linn. Lyon, 1864, 249.
Stilbum calens, Ab. Ann. Soc. Linn. Lyon, 1879, 40.
Stilbum cyanurum, Mocs. Mon. Chrysid. (1889), 190, 202 (var. *splendidum*, p. 193).

Pundaloya (*Green coll.*).

Genus CHRYSIS, Linnæus.

339. CHRYSIS FUSCIPENNIS, Brullé.

Chrysis fuscipennis, Brullé, Hym. iv. 38, 24 ♀; Mocs. Mon. Chrysid. 370 ♀ ♂.

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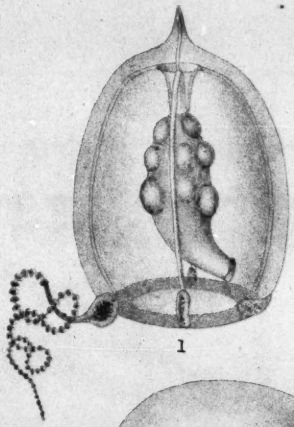

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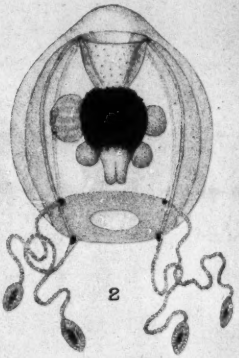

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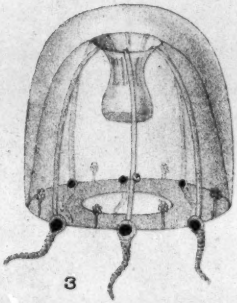

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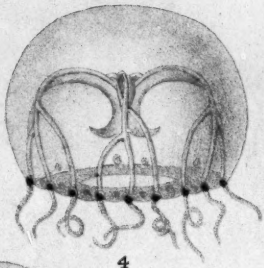

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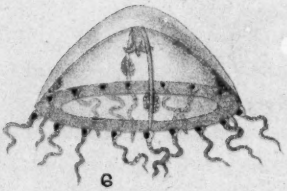

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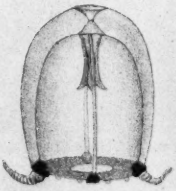

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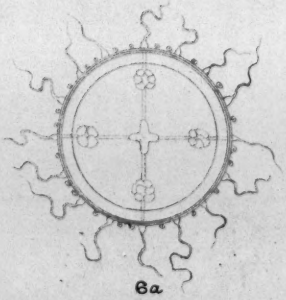

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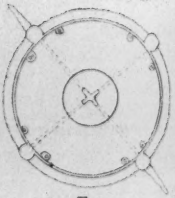

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E.T.B. ad nat. del.
M.P. Parker lith.

West, Newman imp.

British Medusae.

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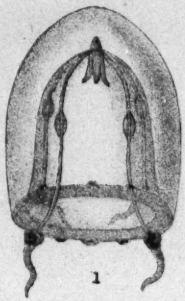

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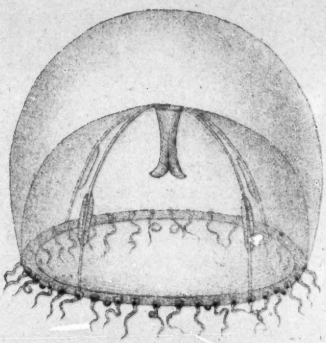

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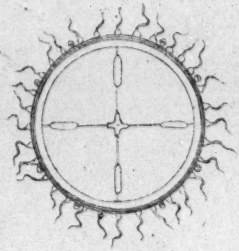

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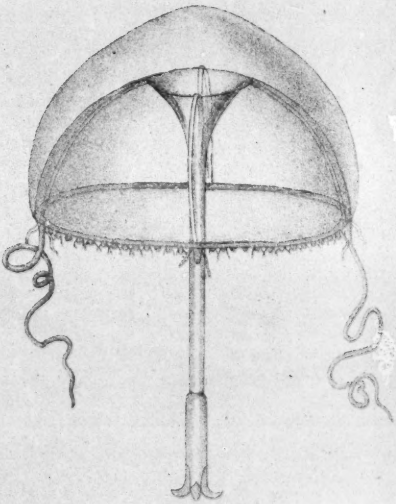

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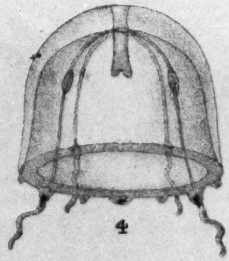

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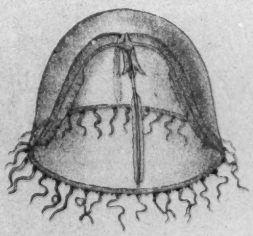

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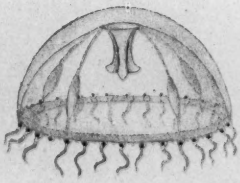

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E.T.B. ad nat del.
M.P. Parker lith.

West, Newman imp.

British Medusae.

Chrysis pulchellus, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. xxvi. (1887), 10.

340. CHRYSIS OCULATA, Fabricius.

Chrysis oculata, Fabr. Syst. Ent. 357, 3; Ent. Syst. ii. 239, 5; Syst. Piez. 171, 6; Dahlb. Hym. Eur. ii. 310, 176; Smith, Jour. Linn. Soc. xi. (1867), 398, 7; Mocs. Mon. Chrysid. 543, 638, ♀ ♂.

Pyria oculata, Brullé, Hym. iv. 19, 1.

341. CHRYSIS PRINCIPALIS, Smith.

Chrysis principalis, Smith, Trans. Ent. Soc. 1874, 461, 13 ♀; Mocs. Mon. Chrysid. 559, 659 ♀ ♂.

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Fig. 1. *Sphex nigripes*, Smith, p. 440.
1 *a*. „ „ front of face and clypeus.
2. *Salius rubidus*, Bingh., p. 435.
3. *Sphex tyrannica*, Smith, p. 440.
3 *a*. „ „ front of face and clypeus.
4. *Methoca nigra*, sp. nov., p. 427.
5. *Pompilus ignicolor*, sp. nov., p. 432.
6. *Crabro palitans*, sp. nov., p. 446.
7. *Salius properus*, sp. nov., p. 436.
8. *Gorytes greenii*, sp. nov., p. 444.
9. *Megachile ceylonica*, sp. nov., p. 453.

2. On British Hydroids and Medusæ. By EDWARD T. BROWNE, B.A., F.Z.S., Zoological Research Laboratory, University College, London.

[Received March 14, 1896.]

(Plates XVI. & XVII.)

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INTRODUCTION.

These notes refer chiefly to Medusæ taken at Plymouth during September 1893, and from the middle of August to the end of September 1895, and also during April and May 1895, in Valencia Harbour, on the West Coast of Ireland.

I published, last year, a few notes on the Medusæ taken at Port Erin, Isle of Man, and have avoided in this paper, so far as possible, a repetition of those notes, but have revised the nomenclature in a few cases. I have not yet made sufficient progress with the study of our Medusæ to justify the publication of anything more than a few selected notes on the species which are best known to me.

The double system of classification, with one name for the hydroid and another for the medusa, I no longer intend to use. In cases where the hydroid form of the medusa is known I have used both the generic and specific names of the hydroids, without any alteration; but in cases where the medusa only is known I have given the generic names as used by Haeckel in his monograph, but not always his specific names. It is my intention to transfer these medusæ to their hydroid names as soon as the hydroid forms are discovered.

In some instances the free-swimming medusa has been described before the hydroid form was known, but I do not feel justified in changing the specific names of the hydroids, which are now so well known, as it would lead to a considerable amount of confusion.

The introduction of formaldehyde as a preserving fluid instead of alcohol is of great importance to the marine naturalist, especially when working in localities where it is difficult to obtain a supply of good spirit. I first tried formaldehyde for preserving marine animals at Valencia last year. The results both for hydroids and medusæ were far superior to those obtained by means of alcohol. The colour, however, is not permanently preserved. Specimens preserved in formaldehyde, even when killed with the usual reagents, are practically useless for histological work. The best

results with hydroids and medusæ have been obtained when the specimen has been killed by a fixing reagent, and then placed first into a 2½ p. c. solution and finally into a 5 p. c. solution of formaldehyde.

I owe my sincere thanks to Professor Weldon for allowing me the use of a table in his Research Laboratory at University College, and for the aid and kind advice which he has so often generously given. To Mr. E. J. Allen, Director of the Marine Laboratory at Plymouth, I am indebted for his kindness in arranging expeditions for the collection of specimens during my visit to Plymouth.

Part I.—HYDROIDS AND THEIR MEDUSÆ.

(Hydroida Gymnoblastea.)

In the first part of these notes the Medusæ come under their hydroid names, and are arranged according to Allman's classification. The synonyms are divided into two sets: the first set contains the names given to the hydroid form, and includes, also, the references to the medusa whilst attached to the hydroid, or reared from the hydroid in confinement. The second set of synonyms refers only to free-swimming medusæ taken in the sea, which have been usually described under other names.

Fam. Syncorynidæ.

Gemmaria implexa (Alder).

Tubularia implexa, Alder (1857).
Coryne pelagica, Alder (1857).
Coryne briareus, Allman* (1859).
Coryne implexa, Wright (1859); Alder* (1861).
Zanclea implexa, Allman* (1864); Hincks* (1868).
Gemmaria implexa, Allman* (1872); Haeckel* (1879).

* References marked with an asterisk denote that medusa-buds upon the hydroid are also referred to.

Two specimens of the medusa were taken at Plymouth on Aug. 31st, 1895. Both were about 1 mm. in diameter, and corresponded to the figures given by Allman in his monograph. The hydroid form has not yet been recorded for the South of England.

The medusa of *Gemmaria implexa* is very much like a medusa described by McCrady as *Gemmaria gemmosa*, found in Charleston Harbour, U.S.A.

Distribution. Scotland—Forfarshire, *Allman* (H [1]). Firth of Forth, *Wright* (H); *Allman* (H).

England—30 miles E. of Holy Island, *Alder* (H). Cullercoats, *Alder* (H); Seaham Harbour, *Hodge* (H); Plymouth, *E. T. B.* (M [1]).

[1] H = Hydroid form, with or without medusa-buds.
M = Free-swimming medusoid form only.

Fam. BOUGAINVILLIDÆ.

PERIGONIMUS REPENS (Wright).

Hydroid Form.

Atractylis repens, Wright* (1858); Alder* (1862).

Perigonimus repens, Hincks* (1868); Allman* (1872); Winther (1880); Duerdin (1893); Garstang* (1894).

Perigonimus minutus, Allman* (1863); Hincks* (1868); Allman* (1872).

Medusoid Form.

Perigonimus repens, Crawford (1895).

At Plymouth, on September 2nd, 1893, I placed a colony of *Perigonimus repens* in a jar of sea-water. On the following day about a dozen medusæ were budded off. On the 13th another two dozen were swimming in the jar from the same colony. None of the medusæ showed any signs of further development after their liberation from the hydroid colony.

The umbrella of the medusa is about ¾ mm. in length and width. There are two opposite perradial tentacles and two opposite perradial bulbs, without tentacles. Some of the specimens have a knob at the aboral end of the umbrella. The knob varies in size and shape in different individuals, in a few it is absent.

Mr. W. Garstang sent me a colony from Plymouth, on March 17th, 1894. On the 19th two medusæ were budded off, one with a short knob at the aboral end of the umbrella, the other without a knob. Unfortunately I was not able to keep these medusæ alive long enough to observe any further changes. Wright (1861) states that he has kept the medusa until it had four perradial tentacles and four interradial bulbs.

Allman (1863) described another hydroid, *Perigonimus minutus*, which, he states, is very much like *Perigonimus repens*. The chief difference is in the shape of the medusoid, which has a constriction across the aboral end of the umbrella. The figure given by Allman of this medusa agrees with the specimens with a conical knob, bred in my jars. Hincks (1868) has placed *Perigonimus minutus* as a synonym of *Perigonimus repens*; but Allman (1872) has again separated them into two distinct species. As I have obtained from the same colony medusæ similar to Wright's figures of *Perigonimus repens* and to Allman's figures of *Perigonimus minutus*, I do not now see any reason for their separation into two distinct species.

DISTRIBUTION. Denmark, Baltic Sea, *Winther* (H). Heligoland, *Hartlaub* (H).

Scotland—Shetland Islands, *Allman* (H). St. Andrews, *Crawford* (M). Firth of Forth, *Wright* (H).

England—Cullercoats (Northumberland), *Alder* (H). Plymouth, *Garstang and E. T. B.* (H). Ilfracombe, *Hincks* (H).

Ireland—S.W. Coast, *Duerdin* (H).

Fam. PODOCORYNIDÆ.

PODOCORYNE CARNEA, Sars.

Hydroid Form.

Podocoryne carnea, Sars* (1846); Hincks* (1868); Allman* (1872); Duerdin (1893); Garstang* (1894).
Podocoryne albida, Sars (1846).

Medusoid Form.

Podocoryne carnea, Crawford (1895).
Dysmorphosa carnea, Haeckel (1879); Browne (1895).
Lizzia blondina, Böhm (1878).

Sars first described both the hydroid and medusoid forms of *Podocoryne carnea*. Haeckel has, however, given the name *Dysmorphosa carnea* to the medusa. The medusa of *Podocoryne carnea* must not be confused with *Dysmorphosa minima*, Haeckel, which I believe to be the earliest stage of *Lizzia blondina*, Forbes. The latter has its stomach upon a peduncle, and medusa-buds are usually present upon the walls of the stomach in the early stages.

At Plymouth, in September 1893, and again in 1895, I tried to rear the young medusæ budded off from the hydroid colonies kept in glass jars. The experiments did not yield any results, as the medusæ died off within a week.

The young medusæ do not all leave the hydroid colony with the same number of tentacles. All have four single perradial tentacles, but the number of interradial tentacles shows variation. The usual number is either two or three, but I have seen a specimen with only one tentacle. The interradial tentacles do not appear in any definite order. In some specimens the two interradial tentacles are opposite one another, in others they occupy adjacent quadrants of the umbrella.

I have not seen a specimen with eight tentacles amongst those reared in my jars, but have taken specimens in the tow-net.

At Valencia, on April 10th, 1895, I took a specimen of the medusa with eight tentacles.

DISTRIBUTION. Norway, *Sars* (H). Naples, *Sars* (H).

Scotland—St. Andrews, *M'Intosh* (M); *Crawford* (M). Firth of Forth, *Allman* (H).

England—Plymouth, *Garstang and E. T. B.* (H, M). Isle of Man, *Browne* (M).

Ireland—Long Island Bay, *Duerdin* (H). Valencia Island, *E. T. B.* (M).

Fam. CORYMORPHIDÆ.

CORYMORPHA NUTANS, M. Sars. (Plate XVI. fig. 1.)

Hydroid Form.

Corymorpha nutans, M. Sars* (1835); Forbes and Goodsir (1840); Johnston (1847); Sars* (1859); Hodge* (1861); Allman* (1863) (1864); Hincks* (1868); Allman* (1872);

Sars * (1877); Haeckel (1879); [medusa = *Hybocodon nutans*] Haddon (1885); Hincks (1886); Hartlaub (1894); Allen * (1895).

Corymorpha galanthus, Haeckel (1879).

Medusoid Form.

Corymorpha nutans, Allman (1863); Garstang (1894); Crawford (1895).

Steenstrupia rubra, Forbes (1848); Peach (1849); Haddon (1885); Browne (1895).

Steenstrupia flaveola, Forbes (1848).

Steenstrupia galanthus, Haeckel (1879); Hartlaub (1894).

The hydroid form of *Corymorpha nutans* with medusa-buds was first described by Sars from specimens taken on the Norwegian coast. Forbes and Goodsir a few years later added the hydroid to the British list by finding specimens off the Orkney Islands. Hodge has described specimens from Seaham Harbour and Allman from the Firth of Forth.

Allman, Hincks, Hodge, and Johnson consider the British species to be that described by Sars, and call it *Corymorpha nutans*.

Haeckel, however, states that the Norwegian species is quite distinct from the British species. He retains the name *Corymorpha nutans* for the Norwegian hydroid and calls the medusoid *Hybocodon nutans*. The English species has been given the new name of *Corymorpha galanthus* and its medusoid called *Steenstrupia galanthus*; under the latter name Haeckel places the medusoid *Steenstrupia rubra*, Forbes, as a synonym.

This separation is entirely based upon the shape of the umbrella of the medusa. Sars described the young medusa upon the hydroid as having an oblique margin to the umbrella, like *Hybocodon prolifer*. This has led Haeckel to place the medusa in the genus *Hybocodon*.

Haeckel apparently, judging from his references, has only read the description of the English species in the monographs by Hincks and Allman. In these, the margin of the umbrella is described and figured as occupying its normal position at right angles to the longitudinal axis of the umbrella, and no mention is made of the obliqueness of the margin of the umbrella of the medusa whilst attached to the hydroid. But in the original papers published by Hodge (1861) and by Allman (1863) on the hydroid *Corymorpha*, the medusa is described with an oblique margin to the umbrella; it therefore corresponds with the description given by Sars. Hodge gives figures of the medusæ upon the hydroid, and the margin is shown to be distinctly oblique. He not only figures the medusæ upon the hydroid but gives an excellent figure of the free-swimming form, just liberated from the hydroid kept in his aquarium. The free-swimming medusa, as figured by Hodge, has the margin at right angles to the longitudinal axis of the umbrella; therefore it cannot be oblique. Allman (1863), in his original description of *Corymorpha*, on the development of the medusa states:—"The four peripheral processes continue to

elongate and are soon seen to be dilated into bulb-like expansions at their extremities. The bulbs increase in size and come in contact by their sides; while one of them, enlarging much more rapidly than the other three, gives a marked preponderance to its side of the bud and makes the distal end of the bud appear obliquely truncated. It then begins to extend itself beyond this distal end into a thick hollow tentacle."

Allman also obtained free-swimming medusæ from his hydroids, which he has described and figured in his monograph. These are similar to the figures given by Hodge, and have a margin at right angles to the longitudinal axis of the umbrella.

From the description given by Allman of the development of the medusa, it appears that the rapid growth of the large tentacle-bulb extends the length of the umbrella more on that side than on the other, and in this way the margin becomes oblique, as one side of the umbrella is longer than the other. It is clear from the descriptions given by Hodge and Allman, that the obliqueness must disappear before the medusa is liberated, as they figure the free-swimming form with the margin in the normal position. I think that these observations on the obliqueness of the margin of the umbrella strengthen the view that the British and Norwegian specimens belong to the same species, and I have again united them under the old name of *Corymorpha nutans*.

Forbes has given only two species in his medusoid genus *Steenstrupia*, namely *S. rubra* and *S. flaveola*. I agree with Haeckel in considering that these are not distinct species. The characteristic features of these medusæ are similar to those of the medusæ of *Corymorpha nutans*. The figures given by Forbes of *Steenstrupia* show the characteristic points of the species, but they are not good figures of a healthy specimen of the medusa of *Corymorpha*.

Hodge recognized the similarity between *Steenstrupia* and the medusa of *Corymorpha*, but was led by Forbes's figures to consider the latter as another species.

Allman states the medusa of *Corymorpha* "belongs to a form to which Forbes has given the generic name of *Steenstrupia*." Sars (1877) writes, "It is even not improbable that when disconnected from the parent animal, they (the medusæ) may develop themselves into the species described by Forbes under the name of *Steenstrupia rubra*."

During my visit to Valencia Island in 1895, I found medusæ corresponding to the descriptions and figures given by Hodge and Allman of the medusa of *Corymorpha nutans* (Pl. XVI. fig. 1). They were often exceedingly abundant during April and May, and some occasions many hundreds could have been quickly collected. One day I thought that a lovely Siphonophore had entered the net, but closer examination showed some dozens of these medusæ, caught by the tentacle, on a piece of cotton about an inch and a half long.

The umbrella is bell-shaped, nearly twice as long as wide; the aboral end of the umbrella is extended into a spine-like process, which is always present, and is a characteristic feature of the

medusa. By this it may be distinguished from another uni-tentacular medusa—*Euphysa aurata*.

The aboral end of the umbrella varies in shape. In some specimens it is round, and the process is conspicuous by its spine-like appearance; in others there is a gradual slope from the side of the umbrella to the apex of the umbrella, forming a cone-shaped summit. The manubrium is about two-thirds the length of the umbrella-cavity; occasionally, when fully expanded, it may reach a little way beyond the margin. The mouth is round, without lips. The stomach is attached to a short peduncle. From the base of the stomach an apical stalk is always present and runs up into the spine-like process of the umbrella. On the margin of the umbrella there is only one large perradial tentacle, ringed with nematocysts, and when fully expanded is about four times the length of the umbrella. Three other perradial bulbs, long and narrow, without tentacles, curl over the margin of the umbrella.

The colour of the medusa shows little variation: the tentacle, bulbs, and stomach are usually of a light pinkish colour, but sometimes reddish brown. In some of the largest specimens the extreme apex of the spine-like process may be slightly tinged with a pinkish colour. The size of the umbrella varies according to age; the youngest specimens taken in the net measured about 1 mm. in length, the umbrella of the largest measured 6 mm. Many were taken about 5 mm. in length and 3 mm. in width.

Distribution. Norway, *Sars* (H). Heligoland, *Hartlaub* (H, M); *Haeckel* (M).

Scotland—Orkney Islands, *Forbes & Goodsir* (H). Shetland Islands, *Allman* (H); *Forbes* (M). St. Andrews, *Crawford* (M). Firth of Forth, *Allman* (H, M).

England—Seaham Harbour, *Hodge* (H). Plymouth, *Heape* (H); *Allen* (H, M); *Garstang* (M). Fowey, *Alder* (H); *Peach* (M). Penzance, *Forbes* (M). Mersey Estuary, *Hincks* (H). Isle of Man, *Alder* (H); *Browne* (M).

Ireland—Kingstown, *Haddon* (H, M). Valencia Island, *E. T. B.* (M).

Fam. Hybocodonidæ.

Hybocodon prolifer, Agassiz.

Hydroid Form.

Hybocodon prolifer, Agassiz * (1862); Allman * (1872).

Corymorpha prolifer, Haeckel (1879) [Medusa = *Hybocodon prolifer*].

Medusoid Form.

Hybocodon prolifer, Böhm (1878); Crawford (1895).

Coryne (*Corymorpha*) *fritillaria*, Steenstrup (1842).

Diplonema islandica, Greene (1857).

Steenstrupia owenii, Greene (1857).

Steenstrupia globosa, Sars, M. (1859); Sars (1877).

Amphicodon fritillaria, Haeckel (1879); Browne (1895).

Amphicodon globosus, Haeckel (1879).

Amphicodon amphipleurus, Haeckel (1879); Garstang (1894); Allen (1895).

The different stages in development of this medusa having been taken in localities far apart, and the wrong hydroid form assigned to one of them, has led to six distinct species being recorded. Haeckel retains four of these and places two amongst the synonyms.

I have recently given an account of this interesting medusa in the Report on the Medusæ of the Isle of Man, and here only give a summary with some additional notes on the occurrence of the medusa at Plymouth and Valencia Island.

The great abundance of this medusa at Port Erin during 1893 and 1894 enabled me to identify the early stages as species already described.

The first stage has only one tentacle, to which belongs *Steenstrupia* (*Amphicodon*) *globosa*, Sars, but only those specimens described with one tentacle.

The second stage has a single group of two tentacles, to which belongs *Coryne* (*Amphicodon*) *fritillaria*, Steenstrup.

The third stage (adult) has a single group of three tentacles, to which belong certain specimens of *Steenstrupia* (*Amphicodon*) *globosa* with three tentacles and *Amphicodon amphipleurus*, Haeckel.

The medusa first reproduces by means of numerous buds at the base of the tentacles, and when gemmation is about to cease ova or spermatozoa appear upon the walls of the stomach. The sexes are separate, and the ovum finally develops into a *Corymorpha*-like hydroid. The development takes place inside the umbrella-cavity, and the hydra remains attached to the wall of the stomach until two verticils of tentacles are formed. Steenstrup described the medusoid *Coryne fritillaria* from free-swimming specimens, and also dredged a hydroid having a single verticil of tentacles, and medusæ attached to it, without tentacles, but with an oblique margin to the umbrella—one of the characteristic features of the free-swimming medusæ. He naturally considered this hydroid to belong to the medusoid *Coryne fritillaria*. It is clear, however, from the development of the hydroid within the umbrella-cavity, that the hydroid must have two verticils of tentacles.

The hydroid has not yet been taken in the British area, but it is evident from the distribution of the medusoid form that it must exist in more than one locality. It may be difficult to recognize the hydroid form without its medusa-buds; but with medusæ, the presence of the five longitudinal bands of nematocysts upon the ex-umbrella of the medusa ought at once to establish its identity and to distinguish it from *Corymorpha nutans*.

Valencia.—On the first day of tow-netting, April 5th, a single specimen was taken, and about two dozen more during the next few days, but not one was seen after April 16th. The specimens were similar to those taken at Port Erin. Some had ova upon the wall of the stomach; others had young hydræ either attached to the stomach or free within the umbrella-cavity.

Plymouth.—Garstang (1894) has recorded this medusa for Plymouth. It was taken on a few occasions during April 1894.

Mr. E. J. Allen kindly sent me five specimens alive, on March 19th, 1895.

Two possessed a single tentacle and three had two tentacles. Medusa-buds were present at the base of the tentacles in some of the specimens. The five specimens showed a great variation in colour: one had the endoderm of both tentacles of a pinkish colour; two specimens had the mouth, tentacle-bulbs, and medusa-buds of a brilliant crimson colour, and another specimen with the same parts coloured reddish orange. One specimen showed the mouth and tentacle-bulbs of a crimson colour and the medusa-buds colourless.

DISTRIBUTION :—

Hydroid Form.

North America, Massachusetts Bay, *Agassiz.*

Medusoid Form.

Iceland, *Steenstrup.* Norway, *Sars.* Heligoland, *Böhm.* France, Granville, *Haeckel.*

Scotland—St. Andrews, *Crawford.*

England—Plymouth, *Garstang and Allen.* Isle of Man, *Browne.*

Ireland—Dublin Coast, *Greene.* Valencia Island, *E. T. B.*

Fam. HYDROLARIDÆ.

LAR SABELLARUM, *Gosse.* (Plate XVI. figs. 3, 4.)

Hydroid form.

Lar sabellarum, Gosse (1857); Hincks * (1872); Allman (1872).

Medusoid Form.

Willsia stellata, Forbes (1848); Cocks (1849); Peach (1849); Gosse (1853).

Willia stellata, Agassiz (1862); Haeckel (1879); M'Intosh (1890); Garstang (1894).

The remarkable hydroid *Lar sabellarum* was first described by Gosse (1857) from a colony, found growing upon the tube of a *Sabella*, in an aquarium. The odd appearance of the hydroid and the absence of gonophores justified Allman's statement, "We are almost tempted to regard it as an abnormal condition of some other form." Fifteen years after its first appearance in Gosse's aquarium another colony was dredged by Hincks at Ilfracombe. Hincks (1872) not only confirms the description given by Gosse, but describes the reproduction in the following words:—

"The fertile polypites of *Lar* are distributed along the creeping stolon, amongst the alimentary zooids, and bear a strong general resemblance to those of *Hydractinia*. They are slender, somewhat filiform bodies, destitute of tentacula, and terminated at the free extremity by a globular enlargement, in which many thread-cells are imbedded; they are generally inferior in size to the alimentary

polypites. The reproductive buds are borne in clusters of three or four on the upper portion of the body, and when matured detach themselves as free medusiform zooids (planoblasts); they are destitute of an ectothecal covering, and are therefore freely exposed to the surrounding water. In an early stage of development the buds are much elongated, and take on their hemispherical form as they approach maturity. The planoblast, at the time of its liberation, is almost hemispherical in form; the umbrella is perfctly colourless and destitute of thread-cells. The digestive sac or manubrium is very mutable in shape; normally it is subcylindrical, and somewhat swollen at the base, with a slightly lobate mouth. Six radiating canals traverse the umbrella, terminating on the margin in as many oval bulbs of a brownish colour, from which six smooth tentacles originate. Both ocelli and lithocysts are wanting; but halfway between every two tentacles a minute sac occurs on the margin of the umbrella, containing two or three glittering bodies, which appear to be thread-cells. The planoblast, when detached, bears with it a portion of the peduncle which had formed the bond of connexion between it and the parent stock; this survives as a somewhat conical process above the base of the manubrium, but it is no doubt absorbed after a time. Six is an unusual number for the radiating canals; amongst the British Hydroida it is met with only in *Clavatella* (which has also occasionally four) and in the genus *Willsia* of Forbes."

I have every reason for believing that the young medusa of *Lar* is the first stage in the development of the medusa which has been described by Forbes as *Willsia stellata*.

At Plymouth in September 1893 the medusoid *Willia stellata* was fairly abundant, and sufficient specimens were obtained to trace its connexion with a medusa which exactly corresponds to the description and figures given by Hincks of the medusa of *Lar sabellarum*. During April and May, 1895, I again met with *Willia stellata* in Valencia Harbour, Ireland, and was able to confirm the observations made at Plymouth.

Forbes first discovered *Willsia stellata* at Oban in 1845, and dedicated the genus to Dr. Will of Erlangen. Agassiz changed the spelling to *Willia*.

Forbes has described the adult form of medusa. The early forms of it may be naturally divided into three distinct stages, according to the number of tentacles:—

First Stage. Six uniform tentacles. (Plate XVI. fig. 3.)—Umbrella, about one millimetre in length and width, varying slightly in shape but usually subhemispherical, with a broad velum. The manubrium reaches about halfway down the umbrella-cavity. In some specimens taken at Valencia the apical stalk ("Stielcanal" of Haeckel), which connected the medusa to the hydroid, was still visible in the mesoglœa of the umbrella, running from the base of the stomach nearly to the ex-umbrella. In most specimens the apical stalk had disappeared.

The stomach is on a very short peduncle, and has six short prolongations or lobes from which the radial canals start. The mouth is variable in shape, being either round or with four to six lips. Six radial canals run from the lobes of the stomach direct to the ring-canal without giving off any branches. Six tentacles, equal in size, on the margin of the umbrella, one opposite the termination of each radial canal. The basal bulb of each tentacle is large and conspicuous, containing dark brown or blackish pigments. Midway between every two tentacles a small cluster of nematocysts is situated on the ex-umbrella just above the margin.

This stage corresponds to the description given by Hincks of the medusa of *Lar sabellarum*.

Second Stage. Twelve uniform tentacles.—The commencement of the second stage is indicated by the growth of six small bulbs on the margin of the umbrella, midway between the primary tentacles. From each of these bulbs a tentacle grows until it resembles in size the tentacles belonging to the first stage. A bulb on its first appearance is of a yellowish-brown colour, but when fully grown it becomes dark brown or black. As soon as a bulb makes its appearance on the margin of the umbrella, a branch is given off from the radial canal and joins the ring-canal opposite the bulb.

The branch is always given off from the same side of each radial canal, and leaves the canal about the middle of its course on the side of the umbrella. The six lobes of the stomach have now become more conspicuous and extend over the upper part of the sub-umbrella. It is on the sides of these lobes that the reproductive cells develop. The clusters of nematocysts belonging to the first stage still remain, and twelve new clusters appear close to the margin, one midway between every two tentacles. Medusæ belonging to the second stage are about 2 mm. in diameter.

Third Stage. Eighteen uniform tentacles. (Plate XVI. fig. 4).—This stage commences with the growth of another set of six bulbs, which develop tentacles in the same manner as in the previous stage.

The new bulbs are not on the same side of the main radial canals as those belonging to the second stage, but on the opposite side. A new branch leaves each radial canal nearly opposite the junction of the first branch and runs down to the bulb on the ring-canal. In this stage each radial canal has two branch canals, one on each side of it, the whole forming a kind of three-pronged fork, with a tentacle at the end of each canal. At this stage the reproductive cells are clearly visible, and are situated along the six lobes of the stomach and arch over the top of the sub-umbrella, forming a star-like pattern of a yellowish-brown colour, hence Forbes's specific name of the medusa.

The clusters of nematocysts belonging to the first stage, and probably some belonging to the second stage, have now disappeared, and a new cluster is developed midway between every pair of tentacles. The clusters of nematocysts form an excellent mark for

measuring in length the growth of the umbrella. Each series arises either on or very close to the margin, and as the umbrella grows in length so does the distance increase between the margin and each series.

If all the clusters were present, they would form, at the adult stage, four rows, one above the other—the uppermost set, with six clusters, representing the first stage, and the lowest, with twenty-four, belonging to the adult stage.

Forbes does not mention the clusters of nematocysts in his description of the species. Gosse has again described the adult, and states that five or six clusters are usually present. He gives a figure of a cluster, and of a nematocyst which has discharged its thread.

Adult Stage. Twenty-four uniform tentacles.—The addition of a fourth set of six tentacles brings the young medusa to its adult stage. The new tentacles develop just like the previous ones, and each one occupies a position midway between the tentacles belonging to the first and third stages. I have only seen one specimen which shows the connexion between the third stage and the adult form. In this specimen the third branch does not leave the main radial canal like the first two branches, but is given off from the second branch (the branch developed in the third stage) and runs down between the main radial canal and its second branch to the ring-canal, opposite the new bulb. The subsequent growth of the umbrella so separates the branches as to give the appearance of each canal dividing, about the middle of its course, into four branches, each branch running to one of the tentacles placed about equal distances apart on the margin of the umbrella.

The characteristic features of the different stages may be stated thus:—

First Stage.—6 tentacles; 6 unbranched radial canals; 6 clusters of nematocysts.

Second Stage.—12 tentacles; 1 branch to each canal; 12 clusters of nematocysts.

Third Stage.—18 tentacles; 2 opposite branches to each canal; 18 clusters of nematocysts.

Adult.—24 tentacles; 3 branches to each canal; 24 clusters of nematocysts.

Each set of tentacles usually appears about the same time and some grow faster than others. Forbes states that some of his specimens possessed only twenty tentacles.

Abnormal Forms.—First Stage. One specimen with seven radial canals, tentacles and clusters of nematocysts. Valencia, 1895.

Second Stage. One specimen with seven radial canals, each with one branch; fourteen tentacles and fourteen clusters of nematocysts. Plymouth, 1893.

It is clear beyond all doubt that the hydroid *Lar sabellarum*

belongs to the Gymnoblastic group of Hydroids. The Medusoid *Willia stellata* has been always considered a Leptomedusa and was placed by Haeckel among the Cannotidæ. As I did not know of any clearly proved case of a gymnoblastic hydroid having a medusa which must be classified with the Leptomedusæ, I examined by means of sections the exact positions of the gonads. It is one of the characteristic features of the Anthomedusæ to have the reproductive cells on the wall of the stomach, and of the Leptomedusæ to have the reproductive cells upon the radial canals.

When I first saw *Willia* I certainly regarded it as a Leptomedusa. At the base of the stomach six broad canals are given off; these run along a short peduncle and over the top of the sub-umbrella; along this portion the gonads are situated; at the point where the gonads terminate the canals suddenly decrease in diameter and become somewhat inconspicuous. The question arose whether to consider the broad part of the canal upon which the gonads are situated as a prolongation of the stomach or as a part of the radial canal itself. To determine this point, I cut several series of sections of medusæ belonging to the second and third stages. All the sections clearly show that the endoderm-cells of the stomach are continued, without any change in size or shape, along the whole length of that portion of the canal upon which the gonads are situated. At the point where reproductive cells terminate the canal suddenly decreases in diameter, and the endoderm-cells become very small and flat. I think that portion of the canal upon which the gonads are situated may reasonably be regarded as a prolongation or lobe of the stomach, and that the true radial canal commences at the end of this lobe.

The sections also show reproductive cells at the base of the stomach itself, before it branches into the six lobes.

I think this medusa is as interesting as the hydroid is remarkable. It shows a kind of transitional stage between the Anthomedusæ and Leptomedusæ. The continuation of the endoderm-cells, without change, into the lobes, and also the continuation of the reproductive cells from the base of the stomach itself along the lobes, strongly point to *Willia* belonging to Anthomedusæ, and not to the Leptomedusæ.

DISTRIBUTION:—

Hydroid Form.

England—Ilfracombe, *Hincks* *.

Medusoid Form.

Scotland—St. Andrews, *M'Intosh.* Oban, *Forbes.*

England—Plymouth, *Garstang and E. T. B.* Fowey, *Peach.* Falmouth, *Cocks.* Penzance, *Forbes.* Ilfracombe, *Gosse.*

Ireland—Valencia Island, *E. T. B.*

Part II.—MEDUSÆ WITHOUT OR WITH UNKNOWN HYDROID FORMS.

These Medusæ are arranged according to Haeckel's 'System der Medusen.'

ANTHOMEDUSÆ.

Fam. Codonidæ.

Dipurena halterata (Forbes).

Slabberia halterata, Forbes (1848); Cocks (1849).
Dipurena halterata, Haeckel (1879); Browne (1895).

I have occasionally met with one or two specimens of this interesting medusa.

I saw one specimen at Plymouth on 25th September, 1893. The specimen was unfortunately in a bad condition, the umbrella being turned inside out. The basal bulbs of the tentacles were of a dark brown colour with a single deep crimson ocellus. At the free end of each of the four tentacles there was a very large knob-like cluster of nematocysts, and the upper half contained a dark brown pigment.

A single specimen was taken at Valencia on 10th April, 1895. Umbrella about 1 mm. in length.

Forbes describes and figures the gonads as slight swellings upon the radial canals. This statement requires confirmation. Haeckel, however, has taken a specimen at Jersey, which corresponded to Forbes's description, except that the gonads were upon the manubrium. Haeckel describes three swellings on the manubrium, one above the other, filled with sperm, the lowest swelling reaching nearly down to the mouth.

Distribution. Jersey, *Haeckel*.

England—Plymouth, *E. T. B.* Falmouth, *Cocks*. Mounts Bay, *Forbes*. Isle of Man, *Browne*.

Ireland—Valencia Island, *E. T. B.*

Dipurena, sp.? (Plate XVI. fig. 2.)

During my visit to Plymouth in September, 1895, I obtained upon the 10th two specimens of a medusa which certainly belongs to the genus *Dipurena*. I regard them as early stages on account of medusa-buds being present upon the stomach. I have already shown in the cases of *Amphicodon fritillaria*, *Margellium octopunctatum*, and *Lizzia blondina*, that it is a characteristic feature of the young stages to bud off medusæ, and in the adult stage to have gonads upon the stomach. I believe that *Codonium gemmiferum* and *Sarsia prolifera*, now regarded as distinct species, will be ultimately proved to be only early stages of other known species.

I have not yet been able to trace these early stages of *Dipurena*

to any known species, as none belonging to the genus have been described with medusa-buds.

The specimens were very much alike, but one was twice as large as the other. The umbrella of largest specimen about 1 mm. in diameter, globular, about as long as wide; at the aboral end there is a slight rounded swelling, formed by a mass of mesoglœa. The manubrium reaches nearly down to the velum; stomach large and situated upon a stout peduncle, nearly as long as the stomach; mouth round, not divided into lips. Four medusa-buds upon the stomach (one bud nearly fully developed, the four tentacles visible with brownish basal bulbs). On the margin of the umbrella four tentacles, when fully expanded about twice the length of umbrella, with blackish basal bulbs. At the free end of each tentacle a very large brownish bulb containing nematocysts. Nematocysts are also scattered along the whole length of each tentacle. Cells are present on the peduncle which may be nematocysts. The margin of the umbrella between the tentacles is nearly straight, giving a quadrangular appearance, with a tentacle at each corner. Velum broad.

EUPHYSA AURATA, Forbes.

Euphysa aurata, Forbes (1848); Haeckel (1879); Holt (1891); Crawford (1891); Maas (1893); Browne (1895).

Euphysa mediterranea, Haeckel (1879).

Up to the present time this medusa has not been recorded from many localities. It had only been found in the northern portion of the British area until this spring, when I found it at Valencia. In the 'Report on the Medusæ of the Isle of Man' I have given a description of several specimens, and have shown that a great variation in colour occurs in some specimens, and that *Euphysa mediterranea* is only a brilliantly coloured form of *Euphysa aurata*.

At Valencia this medusa was first taken on April 16th, 1895, and after this date it was often seen in the tow-net, especially towards the end of May, when it became more abundant. Most of the specimens belonged to the early stages, and were much smaller than any taken at Port Erin.

The smallest specimens were about $\frac{3}{4}$ mm. in length, and the average-sized ones about 1–1$\frac{1}{2}$ mm. in length.

The shape of the umbrella, of the tentacle-bulbs, and of the large tentacle is similar in all the stages: thus there is no difficulty in identifying the earliest forms. The smallest specimens usually possess very little colour, a few are quite colourless, generally the tentacle-bulbs have a pale yellowish tint, but in a few specimens a bright yellowish colour existed.

The specimens 2–3 mm. in length possessed more colour. One specimen 3 mm. in length had yellowish tentacle-bulbs, with a deep orange-coloured centre.

Many of the early naturalists described the pigmented basal bulbs as ocelli. I prefer to retain the term 'ocellus' for definite eye-spots, as clearly seen in *Sarsia*, which also has pigmented basal bulbs.

Haeckel gives *Corymorpha nana*, Alder, as the hydroid belonging to *Euphysa aurata*. I am still of the opinion that this is not the right hydroid, as the medusæ are quite distinct.

DISTRIBUTION. Mediterranean, *Haeckel*. Atlantic, about 50 miles N.W. of Scotland, *Maas*.

Scotland—Shetland Islands, *Forbes*. St. Andrews, *Holt*; *Crawford*.

England—Isle of Man, *Browne*.

Ireland—Valencia Island, *E. T. B.*

Fam. TIARIDÆ.

AMPHINEMA DINEMA (Péron et Lesueur).

Oceania dinema, Péron et Lesueur (1809); Eschscholtz (1829).
Dianœa diadema, Lamarck (1817).
Campanella dinema, Blainville (1834).
Saphenia dinema, Forbes (1848); Peach (1849); Cocks (1849).
Saphenia titania, Gosse (1853).
Stomotoca dinema, Agassiz (1862).
Amphinema titania, Haeckel (1879); Garstang (1894).

At Plymouth I found this species fairly abundant during September 1893. Many of the specimens which I took were immature, about 1 mm. in length. One specimen measured 3 mm. in lengtl and 2 mm. in width. The tentacles of this medusa are able to expand to a great length, often to ten times the length of the umbrella. The larger specimens have about two dozen minute marginal bulbs. Stomach yellowish brown. The base of the tentacles is of a crimson or purplish colour.

I again took a few specimens at Plymouth during September, 1895, but not so many as in 1893.

DISTRIBUTION. Scotland—Shetland Islands, *Forbes*.

England—Portland, *Forbes*. Plymouth, *Garstang*; *E. T. B.* Cornwall, *Forbes*. Fowey, *Peach*. Falmouth, *Cocks*. Ilfracombe, *Gosse*.

Fam. MARGELLIDÆ.

LIZZIA BLONDINA, Forbes.

Lizzia blondina, Forbes (1848); Peach (1849); Haeckel (1879); McIntosh (1890); Vallentin (1893); Browne (1895).
Lizzia claparedei, Claparède (1860); Haeckel (1879).
Dysmorphosa minima, Haeckel (1879); Browne (1895).

The specimens taken at Plymouth in 1893 and 1895, and at Valencia in 1895, clearly show that the earliest stage is similar to the medusa described by Haeckel as *Dysmorphosa minima*. The chief difference between *Dysmorphosa minima* and *Lizzia blondina* exists in the number of tentacles, which increase in number during the growth of the medusa.

Dysmorphosa minima has four single perradial tentacles and four single interradial tentacles.

Lizzia blondina has, in the adult stage, four perradial groups of three tentacles and four single interradial tentacles. The increase of new tentacles is shown in the following list.

Specimens collected by Mr. Garstang at Plymouth during July and August, 1893:—

Perradial tentacles....	1111			(9 specimens).
Interradial tentacles ..	1111			
Perradial	1112	2211	2121	2222
Interradial ..	1111'	1111'	1111'	1111

On my arrival at Plymouth at the end of August, 1895, I found *Lizzia* fairly abundant in the tow-net, but no specimens were taken after the second week in September.

The following list drawn up from these specimens shows the increase of the tentacles:—

Perradial....	1112	2121	2221	2222	2223	3332
Interradial ..	1111'	1111'	1111'	1111'	1111'	1111

At Valencia, 1895, *Lizzia* appeared in the tow-net a few days before my departure at the beginning of June. I only obtained a few specimens, which possessed the following number of tentacles:—

Perradial....	2222	2223	3333
Interradial ..	1111'	1111'	1111

The umbrella of the earliest stage is about 1 mm. in length and nearly as wide, with a slight transverse constriction above the sub-umbrella. The largest specimens are about 1½ mm. in length. Nearly every specimen belonging to the early stage has medusa-buds upon the stomach. One of the largest specimens taken at Plymouth had a mass of ova surrounding the walls of the stomach. The budding of medusæ is followed by sexual reproduction, just as in many other medusæ.

There are always four simple oral tentacles, each terminating in a large cluster of nematocysts. I have never seen more than one cluster of nematocysts upon each oral tentacle, and always four single interradial tentacles. These points distinguish *Lizzia blondina* from *Margellium octopunctatum*.

Abnormal Specimen.—An abnormal specimen was taken at Plymouth on 31st August, 1895, with 3 radial canals, 3 oral tentacles, 3 groups of perradial tentacles, with 2 tentacles in each, and 3 single interradial tentacles.

Claparède described and figured a form of *Lizzia*, which Haeckel has regarded as a distinct species and has placed it in his monograph under the name of *Lizzia claparedei*. The medusa has four perradial groups of two tentacles, and four single interradial tentacles; four simple oral tentacles, each terminating in a cluster of nematocysts. Ova upon the walls of stomach. The shape of the umbrella resembles that of *Lizzia blondina*.

Claparède discovered it off Arran Island, in the Firth of Clyde, during September 1859.

I do not think that Claparède's medusa is a distinct species, but a stage in the development of *Lizzia blondina*.

DISTRIBUTION. Heligoland, *Haeckel*.

Scotland—Shetland Islands, *Forbes*. Bell Rock (East coast), *M'Intosh*. Arran Island, *Claparède*.

England—Plymouth, *E. T. B.* Fowey, *Peach*. Falmouth, *Vallentin*. Isle of Man, *Browne*.

Ireland—Valencia Island, *E. T. B.*

MARGELLIUM OCTOPUNCTATUM (Sars).

Cytæis octopunctata, Sars (1836) (1846).

Lizzia octopunctata, Forbes (1848); Peach (1849); Agassiz (1862); Böhm (1878); Clubb (1886); M'Intosh (1890); Vallentin (1893).

Lizzia grata, Agassiz (1865).

Rathkea octopunctata, Haeckel (1879); Giard (1888); Garstang (1894); Allen (1895).

Margellium octopunctatum, Haeckel (1879); Browne (1895).

Margellium gratum, Haeckel (1879).

The medusa first reproduces itself by means of buds upon the stomach, and when it reaches the adult condition either ova or spermatozoa appear upon the wall of the stomach; the sexes being separate. What becomes of the ova after leaving the medusa is at present unknown. The ovum may give rise to a hydroid form or develop directly into a medusa. The young medusæ on leaving their parent have not always the same number of tentacles. There are usually three tentacles in each of the four perradial groups, but occasionally only two; the interradial groups may have either two or three tentacles, rarely only one. As the medusa grows the perradial tentacles increase to five in each group, and the interradial tentacles to three in each group. The change in the number of tentacles has led to some of the early stages being described as distinct species. Sars first described the medusa (*Cytæis octopunctata*) from specimens with three tentacles in all the groups (=*Rathkea* of Haeckel). Forbes described specimens (*Lizzia octopunctata*) having either two or three tentacles in the perradial groups, and three tentacles in the interradial groups. Forbes regarded these specimens as belonging to the same species as those described by Sars. Haeckel, however, has separated these specimens into two genera: those with two tentacles in the perradial groups are placed in the genus *Margellium*; the others in the genus *Rathkea*.

I have already shown, in the Report on the Medusæ of the Isle of Man, that Forbes was right in regarding his specimens as identical with the medusæ described by Sars as *Cytæis octopunctata*. Garstang has also shown that Haeckel was wrong in separating these medusæ into two distinct genera.

Agassiz (1865) has described a medusa, *Lizzia grata* (= *Margellium gratum*, Haeckel), which has five tentacles in each of the four perradial groups and three tentacles in each of the four interradial groups. From the specimens collected at Valencia, I have every reason for believing that *Lizzia grata* is the adult form of *Margellium octopunctatum*.

The early stages of *Margellium octopunctatum* were fairly abundant in Valencia Harbour at the beginning of April, but decreased in number during May. Most of the specimens taken during April and the early part of May had one to four medusa-buds upon the stomach. About the middle of May specimens were taken with either ova or spermatozoa upon the wall of the stomach. The reproductive cells first begin to appear upon the perradial ridges on the outside wall of the stomach, and as they increase in size they form a mass covering the wall of the stomach. As soon as the reproductive cells begin to appear, the budding of medusæ ceases. The compound basal bulbs of the tentacles show little variation in colour, being usually dark brown or black. One specimen, however, had reddish-brown bulbs.

The specimens taken at Valencia resemble those taken at Port Erin. I have no doubt that they belong to the same species, and as they were taken in a distant locality it may be of interest to record some for comparison with those taken at Port Erin. The following list shows the number of tentacles in each perradial and interradial group of 16 specimens taken at Valencia. It is also arranged to show the increase in the number of tentacles during the growth of the medusa.

Perradial	3333	3333	3333	3333	3333	3334
Interradial	1112'	3231'	2222'	2333'	3333'	3333'
Perradial	4343	5334	5344	5433	5444	4454
Interradial	3333'	3333'	3333'	3333'	3333'	3333'
Perradial	5454	5553	5554	5555		
Interradial	3333'	3333'	3333'	3333'		

The above series corresponds very closely with a series given in the Report on the Isle of Man Medusæ.

The umbrella of the earliest stage is about 1 mm. in length, and that of the adult from 3 to 4 mm.

Not only does the medusa increase the number of its tentacles as it grows, but also the number of clusters of nematocysts upon the oral tentacles, which are four in number. Though some of the specimens taken off the Isle of Man possessed the same number of tentacles as *Margellium gratum*, the clusters of nematocysts upon the oral tentacles were fewer in number. Until I had seen an exact similarity in every detail, I did not feel justified in placing *Margellium gratum* as the adult of *Margellium octopunctatum*. At Valencia I specially examined the oral tentacles of every specimen

taken, and found a few specimens agreeing with Agassiz's description of *Margellium gratum*, both in the number of marginal tentacles, and in the number of clusters of nematocysts on the oral tentacles. I think this removes all doubt concerning the identity of the two species.

In the Valencia specimens the clusters of nematocysts develop in the following order:—The earliest stage has each oral tentacle terminating in a single cluster of nematocysts. A second cluster appears near the first cluster upon a short stalk; the tentacle then appears bifurcated, each branch terminating in a round cluster of nematocysts. Two more clusters, each on a short stalk, make their appearance, one on each side of the tentacle, about the middle of its length. This was usually the appearance of the oral tentacles in all the large specimens taken at Port Erin and at Plymouth. At Valencia, in a few of the largest specimens, with four or five tentacles in each perradial group, I observed on each oral tentacle a second pair of lateral clusters of nematocysts, below the first pair. One specimen had a fifth cluster on a short stalk situated midway between the two terminal clusters. This agrees with the development of the clusters described by Agassiz in *Margellium gratum*. Another specimen, however, showed a variation in development, by possessing three terminal clusters and only a single pair of lateral clusters.

Allman (1859) has described and figured a Calyptoblastic hydroid, *Laomedea tenuis* [= *Leptoscyphus tenuis*, Hincks (1868)], which he found at Stromness. The hydroid has gonothecæ each containing a medusa. Allman has not given any description of the medusa inside the gonotheca, and from the figure it is impossible to identify it, chiefly on account of its being at a very early stage in development. Allman found inside the jar containing this hydroid a number of young medusæ which he believed to be closely related to the genus *Lizzia*. From the description given of these medusæ I believe they are probably an early stage of *Margellium octopunctatum*. Allman regards these free-swimming medusæ as the medusa of the hydroid in the jar. This observation has never been confirmed, and if it be true, then a case is established in which a Calyptoblastic hydroid produces Anthomedusæ.

Allman does not state that he has seen a single medusa leave the hydroid nor show in any way that the medusa inside the gonotheca resembles the free-swimming *Lizzia*. I do not think that there is sufficient evidence to prove that the medusæ came from the hydroid, and I hesitate to accept the statement until the observations have been confirmed. It is quite possible that the young *Lizzia* entered the jar along with the sea-water.

DISTRIBUTION. America—Massachusetts Bay, *Agassiz*. Norway, *Sars*. France—Wimereux, *Giard*.

Scotland—Shetland Islands, *Forbes*. St. Andrews, *M'Intosh*.

England—Plymouth, *Garstang*; *Allen*. Fowey, *Peach*. Falmouth, *Vallentin*. Isle of Man, *Browne*.

Ireland—Valencia Island, *E. T. B.*

LEPTOMEDUSÆ.

Fam. THAUMANTIDÆ.

THAUMANTIAS HEMISPHÆRICA, Eschscholtz.

The naturalists who studied marine life at the end of the last century and at the beginning of the present one worked under many difficulties which have now passed away, mainly owing to the improvements in lenses and in the advancement of the chemical methods of preservation.

The descriptions and figures of the jelly-fishes given by the pioneers of marine zoology usually lack the details necessary at the present day for the identification of the species.

The marginal sense-organs or marginal vesicles, which require the use of a microscope to show their presence and structure, have been in most cases omitted, and now recent researches show that they are very important organs for the identification of the species.

The early workers on Medusæ apparently did not recognize the fact that Medusæ, like many other animals, pass through various stages of growth and that the early stages are often unlike the adult forms.

This led to the early stages of Medusæ being described as distinct species, which together with the vague descriptions given and inaccurate drawings has led to much confusion.

I do not think that any good is to be obtained by retaining inaccurate descriptions of Medusæ, and by burdening our literature, already overloaded, with long lists of useless synonyms.

Medusa hemisphærica was first described by Gronovius (1760) from the coast of Belgium. Müller (1766) described a medusa, as *M. hemisphærica*, from the coast of Denmark, and in a later publication (1778) placed Gronovius's medusa as a synonym of it. The descriptions and figures given by these authors are too vague and inaccurate for the identification of the species.

Péron and Lesueur (1809) separated the above medusæ into two species—*M. hemisphærica*, Gronovius, and *Oceania danica* (Müller). Fleming (1828) changed the generic name to *Geryonia*, and Eschscholtz (1829) again changed it to *Thaumantias* and united both species under the name of *Thaumantias hemisphærica*. Lesson (1843) has copied from Eschscholtz, without adding any fresh information.

Macartney (1810) described two species of medusæ taken at Herne Bay in 1804. The one he called *Medusa scintillans*, which is described and figured. This is clearly the common protozoon—*Noctiluca miliaris*. For the other he suggested the name *Medusa lucida*, but stated that it may be a variety of *Medusa hemisphærica*, Gronovius. It is not possible to identify Macartney's medusa from his description. In the same paper Macartney described and figured a large *Scyphomedusa* under the name of *Medusa pellucens*. This medusa was taken by Sir Joseph Banks. "On a passage from Madeira to Rio de Janeiro the sea was observed by Sir Joseph

Banks to be unusually luminous, flashing in many parts like lightning. He directed some of the water to be hauled up, in which he discovered .... a large species of medusa, to which he gave the name *pellucens*. The *Medusa pellucens* measures about six inches across the crown or umbrella."

This is clearly from the figure and description a Scyphomedusa. Shaw (1812) has copied the figure given by Macartney.

Lesson (1843) has not only given *Thaumantias hemisphærica* as a distinct species, but also *Thaumantias lucida*, Macartney. Amongst the synonyms of the latter Lesson has placed *Medusa scintillans* (=*Noctiluca scintillans*) and *Medusa pellucens* (=Banks's Scyphomedusa), but in the description of the species he only gives Macartney's description of *Medusa lucida*. Haeckel apparently has copied from Lesson, without referring to the original papers, as he has placed as synonyms under *Thaumantias hemisphærica* both *Medusa scintillans* and *Medusa pellucens*.

Forbes (1848) next described *Thaumantias hemisphærica*. It is first, however, important to consider Forbes's views upon the value of sense-organs or marginal vesicles for the identification of the species.

Forbes, in 1841, gave the following advice on the identification of species belonging to the genus *Thaumantias*:—

"1st. The number of tentacula (always a multiple of four).
2nd. The presence, absence, size, and colour of the eyes at their bases.
3rd. The colour of the cross-vessels and proboscis.
4th. The shape of the umbrella.
5th. The shapes of the clubs of the vessels.
6th. The form and lobation of the oral proboscis or peduncle.

"I have mentioned these sources of character in what I conceive to be the order of their respective importance, but all should if possible be noted."

I may here say that Forbes's statement that the tentacles are always a multiple of four is not correct. The multiple system is also adopted by Haeckel, and it leads to the assumption that Medusæ have a most wonderful symmetry. The statement holds good up to thirty-two tentacles, but above that number the tentacles, when carefully counted, show odd as well as even numbers. I found, out of 47 mature specimens of *Obelia lucifera*, only two specimens showing an equal number of tentacles in each of the quadrants, and only nine specimens possessing a number that could be equally divided by four. Twenty-six specimens have an even number of tentacles, and 21 specimens an odd number.

Forbes included in his genus *Thaumantias* several Medusæ which have since been transferred to other genera, viz.:—

Thaumantias pilosella (=*Euchilota pilosella*).
Thaumantias lucifera (=*Obelia lucifera*).
Thaumantias melanops (=*Tiaropsis multicirrata*).

All these have certain characteristic features by which they may

be easily recognized. The other fourteen species of *Thaumantias* form a miscellaneous group, which, owing to their vague descriptions, have caused a considerable amount of trouble to recent writers on Medusæ.

Haeckel has divided these species amongst two families—*Thaumantidæ* and *Eucopidæ*—the former characterized by the absence of marginal vesicles, and the latter by the possession of them. Forbes has omitted the vesicles in the descriptions and figures of nearly all his species, and according to his views they were worthless for specific characters. If Forbes had only added these important organs to his drawings, which have been rendered almost useless by their omission, the present confusion would never have arisen. It is clear that Forbes has seen the marginal vesicles in some of the species, as in his monograph (p. 9) he writes:—"I have observed the vibration of the otolites distinctly in more than one species of *Thaumantias*."

After the publication of Forbes's monograph the name of *Thaumantias hemisphærica* appeared on most lists of Medusæ, usually without any description of the medusa.

Since the appearance of Haeckel's monograph the name has gone out of fashion, and *Phialidium variabile* has taken its place. For three years I have searched for *Thaumantias hemisphærica* and the allied species, also without marginal vesicles, but without any success. Every specimen, which has the slightest resemblance to one of Forbes's figures, possesses marginal vesicles.

I may here add that specimens preserved in alcohol are not to be relied upon for the absence of marginal vesicles in the living medusa; the vesicles often shrivel up and the otoliths disappear.

LAODICE CRUCIATA (Forskål).

Haeckel has placed under the name of *Laodice cruciata* no less than twenty-five synonyms, which are divided into two groups—one for the Mediterranean form of *Laodice cruciata*, and the other for the Atlantic form.

The synonyms of the Atlantic form may be divided into two sets, one referring to *Medusa æquorea*, Baster (1759), the other to *Thaumantias pilosella*, Forbes (1848).

Medusa æquorea, Baster (1759); Linnæus (1767).
Callirhoë basteriana, Péron and Lesueur (1809); Eschscholtz (1829); Blainville (1834).

The original descriptions and figures of this medusa given by Baster, and copied by other writers, without any additional information, appears to me to be too vague for the purpose of identification. The drawings clearly show that the sub-umbrella has been injured, as the stomach and some of the bands of gonads on the radial canals are in a damaged condition. Whatever kind of medusa Baster had under observation, the description and figures appear to be too vague to identify it with any species known to us at the present day.

The second set of synonyms of the Atlantic form refers to *Thaumantias pilosella*, Forbes. This medusa I have taken and have been able to clearly establish its identity. The history of this species is given under *Euchilota pilosella* in these Notes. It possesses marginal vesicles and belongs to the *Eucopidæ*, and has no connection whatever with the genus *Laodice*. Agassiz (1862) first placed *Thaumantias pilosella* in the genus *Laodice* as a synonym of *Laodice stauroglypha*.

The synonyms of the Mediterranean form of *Laodice cruciata* may be divided into three sets. The first set belongs to the synonyms of *Medusa cruciata*, Forskål (1775); the second to *Oceania lineolata*, Péron and Lesueur (1809); and the third set to *Thaumantias mediterranea*, Gegenbaur (1856).

Medusa cruciata, Forskål (1775).
? *Aurelia rufescens*, Péron and Lesueur (1809).
Aurelia crucigera, Risso (1826).
Medusa crucigera, Eschscholtz (1829).
Oceania cruciata, Wagner (1841).
? *Medusa cacuminata*, Modeer (1791).
? *Oceania cacuminata*, Eschscholtz (1829).
Laodice crucigera, Lesson (1843).
Thaumantias corollata, Leuckart (1856).

Forskål's description and figures of *Medusa cruciata* do not possess any characteristic features by which they may be identified with any medusa described by recent writers.

Péron gives a vague description of *Aurelia rufescens*, and believes it may be identical with *Medusa cruciata*, Forskål.

Eschscholtz believes that *Medusa cacuminata*, Modeer, may be identical with Forskål's medusa.

Lesson unites all the above synonyms (except *Thaumantias corollata*) under the name of *Laodice crucigera*.

It appears that all the early observers were either describing one species, or if two existed they were not able to distinguish clearly one from the other.

Leuckart describes *Thaumantias corollata* as a new species, and from the description and figure given it seems to be closely related to Forskål's medusa.

The second set of synonyms refers to *Aurelia lineolata*, Péron (1809) and *Dianœa lineolata*, Lamarck (1817).

Péron refers to a "variety of medusa," Borlase (1758). I have looked up Borlase's description and figures: he clearly had under observation a specimen of *Aurelia aurita*.

The third set of synonyms refers to a species called *Thaumantias mediterranea*, described by Gegenbaur in 1856. This species was again described by Haeckel in 1864 under the name of *Cosmetira punctata*. It is quite distinct from *Thaumantias pilosella*, Forbes. It is without marginal vesicles, and possesses both filiform and club-shaped cirri between the tentacles.

I have taken at Valencia three specimens of a medusa which

corresponds with the characteristic features of the genus *Laodice* in possessing filiform and club-shaped cirri between the tentacles, and in the absence of marginal vesicles.

The other species of the genus *Laodice* (*L. mediterranea*, Gegenbaur, *L. calcarata*, Agassiz, and *L. ulothrix*, Haeckel) appear to differ so slightly from one another, that I am inclined to regard them as one species.

The species which have been vaguely described by the early naturalists had better remain provisionally under the name of *Laodice cruciata* (Forskål). I think for the present, until more is known about the genus, that *Thaumantias mediterranea* had better be regarded as a distinct species—*Laodice mediterranea* (Gegenbaur),—and *Cosmetira punctata* as a synonym of it.

I do not intend publishing a description of the Valencia *Laodice* until I have collected more specimens, which may then throw some light upon the other species.

Fam. Eucopidæ.

Euchilota pilosella (Forbes). (Plate XVI. figs. 7 & 7*a*.)

Thaumantias pilosella, Forbes (1848); Gosse (1853).
Laodice pilosella, Agassiz (1862).
Laodice stauroglypha, Agassiz (1862).
Laodice cruciata, Garstang (1894).

Forbes has given a fairly complete description of this species, omitting only the marginal vesicles. These important organs were apparently not considered by Forbes of any importance in the specific description of a medusa. Gosse found this medusa very abundant at Ilfracombe, and described it again under the name *Thaumantias pilosella*, with eight marginal vesicles.

At Valencia, during April and May, I found four specimens of a medusa which is identical with the *Thaumantias pilosella* of Forbes and Gosse.

Forbes in his description of the species states:—"The umbrella, which sometimes measures nearly two inches in diameter, but more usually one, or one and a quarter, is hemispheric, and shaped like a watch-glass, but much more convex. It is transparent and smooth, except on the sides towards the margin, where it is as if woolly, being invested with minute epidermic hairs composed of fibrous cells. These, though sufficiently conspicuous, may escape the observer who is not aware of their presence, in consequence of their transparency.

"The margin is fringed by very numerous (100) extensile (but usually borne rather short), pale pinkish tentacula, with bulbous bases. The bulbs are ocellated, with dense crescentic masses of purple pigment-cells. When the margin is much magnified, it is seen to be bordered by a narrow band or thread of fibrous cells, from which the tentacles spring, and between each pair there are six or seven short, fine, secondary tentacles, without ocelli at their bases. . . The sub-umbrella is depressed, and on its surface run the

four radiating vessels, with a long, linear, somewhat clavate ovary, of a bright pink colour, commencing very near the centre, and terminating close to the margin in the course of each. The stomach is very short, but wide, of a rose colour, and has four lanceolate, fimbriated lips, bordered by a compact edging of fibrous cells."

Gosse's description differs slightly from that given by Forbes. His specimens appear to belong to a younger stage, about three-quarters of an inch in diameter, and with about fifty tentacles. No mention, however, is made of the "minute epidermic hairs composed of fibrous cells" near the margin of the umbrella. The following is the description given by Gosse of the marginal vesicles:—"Besides these organs (tentacles), the margin is furnished with others ..... They consist of cells, usually more or less globose, each containing one or more spherical bodies of high refracting power. Prof. Forbes has not noticed them in his description of this species; they are, however, large and peculiar: first in shape, being semi-elliptical swellings of the substance of the marginal canal, and secondly in the number of their spherules. The spherules are arranged in a double crescentic row, those which form the middle being generally larger than those at the extremities. The capsules are eight in number, two in each quadrant, nearly equally distributed; but not holding any fixed relation of position to the tentacles."

The specimens which I took at Valencia have not only the cirri on the margin of the ex-umbrella (="minute epidermic hairs composed of fibrous cells") as described by Forbes, but also the eight adradial marginal vesicles with numerous otoliths, as described by Gosse. The other details of the species agree with the description given by Forbes and Gosse.

An early stage was taken at Valencia on May 4th. Umbrella bell-shaped, 2 mm. in length and width. Four perradial and four interradial tentacles; and also eight adradial bulbs, from which tentacles will develop in a later stage. A few cirri on the margin between the tentacles and bulbs, but none on the edge of the ex-umbrella. Eight marginal vesicles, each with 4 to 6 otoliths.

The basal bulbs of the tentacles and the bulbs without tentacles are alike in coloration. There is a yellowish centre nearly surrounded by a deep purplish band, which does not meet on the inner side of the bulb.

A specimen was taken 15 mm. in width and 11 mm. in length.

Apparently all the large watch-glass shaped medusæ are in their earliest stages bell-shaped, the umbrella being about as long as wide. The umbrella gradually grows broader; the tentacles at the same time increase in number.

A specimen was taken on April 23rd, at Valencia, with the umbrella 20 mm. in diameter and shaped like a deep watch-glass. The stomach short, and mouth with four fimbriated lips. On the margin of the umbrella 28 large tentacles, and between every pair a large bulb, the commencement of another large tentacle.

Between every bulb and tentacle six to ten cirri, very small and colourless. Scattered on the ex-umbrella, just above the margin, are numerous cirri, such as Forbes described.

Eight adradial marginal vesicles, with about twelve otoliths in each. The gonads are upon the four radial canals, extending from the stomach nearly to the margin of the umbrella. The basal bulbs of the tentacles and the large bulbs without tentacles are alike in colour; a yellow centre nearly surrounded by a purplish band.

I sent to Mr. E. J. Allen, at Plymouth, a description of these medusæ taken at Valencia, and asked him to collect specimens for me. He kindly sent me seven specimens, alive, and some more in formaline, on June 28th. They were similar to the specimens taken at Valencia. The marginal vesicles contained a few more otoliths, arranged in some specimens in two rows. The stomach, mouth, and gonads purplish in colour. The tentacle-bulbs were coloured exactly like those of the Valencia specimens. There were cirri upon the ex-umbrella near the margin, and also between the tentacles. Diameter of the umbrella 10 to 15 mm.

During a visit to Plymouth, in 1893, I saw some specimens of a medusa, labelled *Laodice cruciata*, taken by Mr. Garstang. Some of these specimens are now in my collection. They show the cirri on the ex-umbrella near the margin, and agree in other details with the description given by Forbes. The marginal vesicles are not to be seen, as the specimens are in alcohol. I have proved over and over again that the marginal vesicles often shrivel up in spirit-specimens. Therefore, the absence of vesicles in spirit-specimens does not prove their absence in living specimens.

During a visit to Plymouth in September, 1895, I found in the tow-net a very young medusa, which I believe, from the coloration of the tentacle-bulbs, may possibly be the earliest free-swimming stage of *Euchilota pilosella*. (Pl. XVI. figs. 7 & 7*a*.)

Umbrella bell-shaped, about 1 mm. in length and width. Eight marginal vesicles, with a single otolith in seven of them and two otoliths in the other one (the number of otoliths increases with age). Two opposite perradial tentacles, very short, and two opposite perradial bulbs, without tentacles. The basal bulbs of the tentacles are alike in coloration, a yellowish centre with a purplish band; the bulbs without tentacles colourless.

The mouth has four lips, and the stomach extends into the substance of the umbrella, terminating in an apical stalk, which shows that the medusa has not long been liberated either from another medusa or from a hydroid colony, in this case probably from the latter. I placed this medusa in an aquarium; nine days later the apical stalk had disappeared, but the tentacles remained in same condition.

I think there should be no difficulty in identifying *Euchilota pilosella*. The cirri upon the ex-umbrella near the margin and the eight marginal vesicles distinguish it from any other species,

Mitrocomella polydiadema (Romanes) is very much like *Euchilota pilosella* to the naked eye; but it has sixteen marginal vesicles and no cirri upon the ex-umbrella.

DISTRIBUTION. Scotland—Shetland Islands, *Forbes*.
England—Plymouth, *Garstang*, *Allen*. Falmouth, *Alder*.
Ireland—Valencia Island, *E. T. B.*

EPENTHESIS CYMBALOIDEA, Haeckel.

This is another mysterious medusa which has been handed down to us by the ancient naturalists. Slabber first described it under the name of *Medusa cymbaloidea* in 1775, and Shaw (1789) has copied Slabber's figures and also changed the name to *Medusa campanella*. To judge from the figures given, the medusa appears to be very much like *Thaumantias hemisphærica* (Gronovius) with fewer tentacles. The generative organs occupy the outer half of the radial canals. The medusa was caught by Slabber in the act of swallowing a fish, tail foremost, of which a figure is given. Lamarck (1817) has copied Slabber's description, and Eschscholtz (1829) changed the generic name to *Thaumantias*.

Blainville (1834) has given again Slabber's account of the species and copied his figures, but has left out the wonderful fish.

Haeckel (1879) has placed all these references under the name of *Epenthesis cymbaloidea*, a genus of the Eucopidæ, and characterized by the possession of 16 marginal vesicles and 16 tentacles.

Amongst the synonyms Haeckel has placed *Thaumantias thompsoni*, Forbes, which is also given as a doubtful synonym of *Thaumantias forbesii*, Haeckel (Thaumantidæ, Haeckel). The figure of Slabber's medusa bears no resemblance to Forbes's species, which is more like *Phialidium buskianum* (Gosse). It only requires the addition of the necessary marginal vesicles to make the identification complete. These Haeckel has added.

Eucope gemmigera, Keferstein (1862), is also given as a synonym by Haeckel of *Epenthesis cymbaloidea*. According to Keferstein this medusa has a ciliated medusa-bud upon the stomach. I prefer for the present to regard this medusa as a distinct species. The medusa-bud is not described in detail and the figure shows the external shape only. It may be a young stage of the parasitic *Halcampa*, which often attaches itself to the stomach or the generative organs of medusæ.

Epenthesis cymbaloidea, Haeckel, and its synonyms have no connection whatever with *Phialidium cymbaloideum* (Van Beneden).

PHIALIDIUM VARIABILE, Haeckel.

Under this name Haeckel has united several species which I consider to be quite distinct. He gives no less than 26 references which are divided into two sets, one for the Mediterranean and the other for the Atlantic Ocean.

Just as in the case of *Thaumantias hemisphærica*, the early writers omitted the marginal vesicles, which amongst the Eucopidæ

are of the greatest importance for the identification of the species.

Péron and Lesueur (1809) first described two medusæ—*Oceania flavidula* from Nice [= *Diancæa flavidula*, Lamarck (1817); *Phialidium flavidulum*, Haeckel (1877)], and *Oceania phosphorica* from the English Channel [= *Diancæa phosphorica*, Lamarck (1817); *Oceania phosphorica*, Agassiz (1862); *Phialidium phosphoricum*, Haeckel (1877)]. These Haeckel has given as synonyms of *Phialidium variabile*. The original descriptions appear to me to be too vague for the identification of the species, as the marginal vesicles have been omitted.

Two other medusæ are placed amongst the synonyms by Haeckel viz. *Eucope variabilis*, Claus (1864), and *Thaumantias buskiana*, Gosse (1853). They may belong to the same species, but I prefer to keep them apart until their hydroid forms have been recognized, as *Eucope variabilis* belongs to the Mediterranean (Trieste), and *Thaumantias buskiana* to the British Seas.

Thaumantias buskiana I consider a distinct species, and refer to it in this paper under the name of *Phialidium buskianum*.

Claus (1864 and 1881) has given an excellent description with figures of the growth of the medusa *Phialidium* (*Eucope*) *variabile*. It is quite possible that *Geryonia planata*, Will (1844), from Trieste, *Thaumantias dubia*, Kolliöker (1853), from Messina, and *Phialidium viridicans*, Leuckart (1856), from Nice, may be stages in developmeet of *Phialidium variabile* (Claus).

I have recognized as a distinct species *Thaumantias cymbaloides*, Van Beneden (1861). It possesses only eight marginal vesicles, by which it may be easily distinguished from the other species. I refer again to this species under the name of *Phialidium cymbaloideum* (Van Beneden).

I have found another species which apparently has been mixed up with *Phialidium cymbaloideum* (Van Beneden). I cannot find a good description of this medusa by which it may be distinctly recognized from the other species. To prevent confusion I propose to call this species *Phialidium temporarium*. It is very much like *Phialidium ferrugineum*, Haeckel (1864), from the Mediterranean. It may be the same species, but I prefer to keep them apart until the hydroid forms of both have been clearly identified.

According to Hincks (1868) there are four distinct species of hydroids, viz. *Clytia johnstonii*, Alder, *Campanulina acuminata*, Alder, *C. repens*, Allman, and *C. turrita*, Hincks, which liberate medusæ almost identical in form. These, I have but little doubt, will eventually be proved to be connected with medusæ belonging to the genus *Phialidium*. At present the rearing of these young medusæ has not been carried to the stage which is necessary to connect them for a certainty with the free-swimming *Phialidium*.

PHIALIDIUM BUSKIANUM, Gosse. (Plate XVI. figs. 6 & 6 *a*.)

During my visit to Plymouth in September 1893 and 1895, I collected many specimens of a medusa in various stages of develop-

ment. Owing to the ripe state of the ova in some of the specimens, I was able to distinguish the species as *Thaumantias buskiana*, Gosse. It is quite distinct from *Phialidium temporarium* and *Phialidium cymbaloideum*, as the generative organs never extend along the outer half of the radial canals, and are always round or slightly oval in shape.

It may be difficult to distinguish this species in its early stages from *Phialidium temporarium*. I have not yet met with the two species together; the latter appears in the spring and the early part of the summer, and the former in the autumn.

Gosse named this species after Busk (1849), who described a similar medusa (without giving it a specific name) taken in the Solent during the autumn of 1848.

Unfortunately Busk's figures of the medusa are useless for identification. I believe that Busk took specimens of this species and also of other species which he has confused with it.

Gosse was the first to give this species a description by which it may be readily identified. The following is an abstract of the description:—Umbrella when young globose, when older hemispherical or shallow campanulate, from 2 to 6 mm. in diameter, transparent and colourless. The margin of the umbrella fringed with 20–32 tentacles, very slender and extensile, with yellowish basal bulbs. A marginal vesicle between every two tentacles; sometimes two vesicles present, and occasionally a vesicle has two otoliths. Ovaries small, oval, on the radial canals, containing globular ova in various degrees of development. Stomach small and quadrangular. Taken at Ilfracombe in the autumn.

The Plymouth specimens agree with the description given by Gosse.

The species closely resembles *Phialidium variabile* (Claus), from the Mediterranean. I prefer to keep them separate for the present until the hydroid forms have been identified.

It also closely resembles the figure given by Forbes of *Thaumantias thompsoni*, which was taken by Forbes on the coast of Cornwall and in Roundstone Bay on the west coast of Ireland.

Böhm (1878) has described the medusa under the name of *Clytia johnstoni* from Heligoland.

Hartlaub (1894) has recorded *Phialidium variabile* (Claus) (not Haeckel) from Heligoland.

PHIALIDIUM TEMPORARIUM, Browne. (Plate XVII. figs. 4, 5, 6.)

I find it is necessary to give a specific name to one of the commonest medusæ on our coasts. It is probable that Forbes described this species under the name of *Thaumantias hemisphærica*, but as Haeckel has taken *Thaumantias hemisphærica* as the type of the genus *Thaumantias*, and many other naturalists have placed the species upon their lists, it is necessary to retain it. I have already described some specimens of this species under the name of *Phialidium variabile*, Haeckel, in the 'Report on the Isle of Man Medusæ'; but I have since discovered that *Phialidium*

variabile, Haeckel, consists of several distinct species, one of them being *Phialidium* (*Eucope*) *variabile* (Claus), a species probably identical with *Phialidium buskianum* (Gosse).

Böhm (1878) has given *Campanulina acuminata* as the name of this species, which he has described and figured in the adult stage, taken off Heligoland. Böhm has not reared the medusa from the hydroid, and does not show that the young medusa from the hydroid *Campanulina acuminata* develops into the medusa which he has described under the same name in the adult condition. No doubt the young medusæ from the hydroid *Campanulina acuminata* do develop into one of the species belonging to the genus *Phialidium*. For this reason I have not used Böhm's specific name of the adult medusa, as it may not belong to the hydroid *Campanulina acuminata*.

I give here a description of the various stages of *Phialidium temporarium*:—

1*st Stage*. *Four tentacles*. (Plate XVII. fig. 4.)—The earliest free-swimming stage, which I have seen, was taken at Valencia in May 1895. Umbrella bell-shaped, about $\frac{3}{4}$ mm. in length and width. Four perradial tentacles and four interradial tentacle-bulbs. Eight marginal vesicles with a single otolith in each. Tentacle-bulbs and the basal bulbs of the tentacles yellowish brown. Stomach short; mouth with four short lips. In one specimen the apical stalk, or the prolongation of the stomach into the substance of the umbrella, was still present, indicating that the medusa had not long been liberated from its hydroid. The generative organs form a minute round or oval swelling, one on each radial canal, about halfway down.

2*nd Stage*. *Eight tentacles*.—The interradial bulbs belonging to the first stage develop tentacles, and a little later some of the adradial bulbs begin to appear. It may be sometimes difficult to distinguish at this stage this species from *Phialidium cymbaloideum*, as both possess eight marginal vesicles, but in the latter species I have always seen at least two otoliths in all the vesicles. In *Phialidium temporarium* occasionally two otoliths may be present in one vesicle, but never in all the vesicles.

3*rd Stage*. *Sixteen tantacles and* 16 *or more marginal vesicles*.—The adradial tentacles appear in no definite order, so that one quadrant sometimes contains more tentacles than another. The marginal vesicles also increase in number, one is always present between every two tentacles, occasionally two may be present. The umbrella grows faster in width than in length, being about 6 to 7 mm. in width and 4 to 5 mm. in length. The generative organs grow downward towards the margin and become oval-shaped. The colour of the generative organs shows slight variations, usually yellowish brown, occasionally reddish brown.

Adult Stage. (Plate XVII. figs. 5 & 6.)—The largest specimen which I have measured was 21 mm. in width and 11 mm. in length, with 38 tentacles. Two or three marginal vesicles between every

two tentacles, with a single otolith in each. This specimen was taken off the Isle of Man.

Another specimen, taken at Valencia, measured 20 mm. in width and 11 mm. in length, with 39 tentacles. One to three vesicles between every two tentacles, with a single otolith.

Thirty-nine tentacles is the maximum number which I have counted in one specimen, and I have not seen more than three marginal vesicles between two tentacles. One or two vesicles are usually present between every two tentacles in specimens possessing 30 to 35 tentacles, and one to three vesicles in specimens with more than 35 tentalces. The stomach is short, of a yellowish-brown colour; and mouth with four lips. The generative organs occupy nearly the whole length of the lower or outer half of each radial canal, and terminate very close to the ring-canal. In mature specimens the generative organs hang in folds and are usually of a yellowish-brown colour. I have noticed in some specimens belonging to the intermediate stages that the generative organs have a greenish appearance, and occasionally the stomach and tentacles are greenish too. The greenish colour is not due to a green pigment, but to the reflection of light upon the organs.

Many specimens taken at Valencia were infested with a species of *Cercaria* which lives in the mesoglœa. *Halcampa* usually selected this medusa, and was often seen attached to one of the generative organs, which showed a remarkable decrease in size compared with the others.

PHIALIDIUM CYMBALOIDEUM (Van Beneden). (Plate XVII. figs. 1, 2, & 2*a*.)

Van Beneden first described this medusa in 1866 under the name of *Thaumantias cymbaloides*. I have changed the specific name from the Greek to Latin form, in accordance with the rules on nomenclature. This species has no connection whatever with *Medusa cymbaloidea*, Slabber, and the synonyms connected with it, which Haeckel has placed under the name of *Epenthesis cymbaloidea*.

I first recognized this medusa during my visit to Valencia in 1895, and was able to see many stages in development. As it often occurred along with *Phialidium temporarium*, I was able to compare the different stages.

Van Beneden has not given a figure of the species, but his description is sufficiently good to recognize without doubt its identity with the medusæ taken at Valencia.

1*st Stage*. *Four tentacles*. (Plate XVII. fig. 1.)—Umbrella bell-shaped, about 1½ mm. in length and about 1 mm. in width, with thick walls (thicker than in the corresponding stage of *Phialidium temporarium*). Four perradial tentacles, fairly long, and four interradial tentacle-bulbs. The basal bulbs of the tentacles and the tentacle-bulbs of a yellowish or reddish-brown colour. Eight adradial marginal vesicles, each with two or three otoliths. The

reproductive organs form a small oval swelling about halfway down each of the four radial canals. In some of the specimens belonging to this stage the stomach is prolonged into the substance of the umbrella. The prolongation or apical stalk disappears in the later stages, but its presence indicates in some species that the medusa has not long been liberated from its hydroid. The mouth has four small lips.

2nd Stage. Eight tentacles.—The interradial tentacle-bulbs belonging to the first stage develop tentacles, and a few adradial tentacle-bulbs begin to appear. The marginal vesicles never exceed eight even in the adult form, but the otoliths show an increase in number. At this stage sometimes four otoliths may be present, but usually two or three. Width of the umbrella about 3 mm. and slightly less in height.

3rd Stage. Sixteen tentacles.—The adradial tentacles appear in no definite order, and when they reach nearly their full size other tentacle-bulbs commence to grow. The generative organs form a long oval patch upon the radial canals. The otoliths in each vesicle vary from two to four. Diameter of the umbrella 4 to 5 mm.

Adult Form. (Plate XVII. fig. 2.)—I place under this head all specimens with more than 16 tentacles. They increase in number until 32 is reached, but this number may not be the maximum, though it is the most I have seen in a specimen. The marginal vesicles always remain eight in number, one of the characteristic features of the species and by which it may be distinguished from *Phialidium temporarium*. The otoliths in the vesicles show considerable variation even in the same individual. Three or four appear to be about the usual number present but sometimes more. One specimen had five to eight otoliths. The umbrella becomes very thick especially at the aboral end. By the thickness of the umbrella I could usually recognize this species in an aquarium when in company with *Phialidium temporarium*.

The generative cells, which in the earliest stage form a small oval patch about halfway down each radial canal, gradually grow downwards or outwards but do not touch the margin. Usually of a yellowish-brown colour.

The largest specimen seen measured 13 mm. in width and 4 mm. in height. During my visit to Plymouth in September 1893 I saw several specimens of this medusa, belonging to the 1st and 2nd stages, and some early stages at Port Erin in May 1894.

According to Haeckel this medusa, possessing only eight marginal vesicles and no cirri, ought to be placed in the genus *Tiaropsis*. But as the medusa is more like the species belonging to *Phialidium* than *Tiaropsis*, I prefer to place it temporarily in the genus *Phialidium* until its hydroid has been found, rather than make a new genus.

EUTIMA INSIGNIS (Keferstein).

Siphonorhynchus insignis, Keferstein (1862).

Entima insignis, Haeckel (1879); Garstang (1894); Browne (1895).

A single specimen taken at Plymouth on 3rd October, 1893.

Umbrella 7 mm. in width and 3½ mm. in length. Stomach about 2 mm. long, situated on a peduncle 7 mm. long. Mouth with four large lips. Four very long perradial tentacles, about 20 mm. in length when fully expanded, with a pair of cirri at the base of each. About 30 marginal bulbs, each with a pair of cirri. Eight adradial marginal vesicles, each with 2–5 otoliths. The gonads are on the lower half of the peduncle along the radial canals. The medusa is perfectly colourless.

Another specimen taken at Plymouth on 7th September, 1895. Umbrella 8 mm. in width and 4 mm. in length. Thirty-nine marginal bulbs, which are not evenly distributed upon the margin of the umbrella; the four quadrants of the umbrella possessing 9, 13, 7, and 10 bulbs. The gonads are just commencing to develop upon the radial canals, close to the stomach. The marginal vesicles with 3–4 otoliths. In other details the specimen resembles the one described above.

DISTRIBUTION.—France, St. Vaast, *Keferstein*.

England—Plymouth, *Garstang*; *E. T. B.* Isle of Man, *Browne*.

SAPHENIA MIRABILIS (Wright). (Plate XVII. fig. 3.)

Goodsirea mirabilis, Wright (1859).

Saphenia mirabilis, Haeckel (1879); Cunningham (1891); Bles (1892); Garstang (1894); Browne (1895).

Cunningham obtained some hundreds of specimens off the Eddystone, at night, on 16th July, 1891. The largest 12 mm. in diameter.

At the end of September 1893 I found two specimens at Plymouth having the umbrella about 6 mm. in diameter, and eight marginal vesicles each with three otoliths. During September 1895 I met with a few more specimens at Plymouth. One specimen 5 mm. in width and 5 mm. in length. Eight marginal vesicles with 1–5 otoliths, but the majority possessed 3 otoliths. Two long opposite, perradial tentacles, with a pair of cirri at the base of each. Thirty-nine marginal bulbs, not evenly distributed between the radial canals; a pair ofcirri usually present on each bulb. Manubrium very long. Medusa colourless.

A very small medusa taken on 16th Sept., 1895, may possibly be the earliest free-swimming stage of *Saphenia* (Plate XVI. fig. 5 and fig. 5 *a*). Umbrella bell-shaped, slightly longer than wide; about ½ mm. in length. Manubrium about one quarter the length of the umbrella-cavity.

The stomach is not on a peduncle, but has a short conical knob at its base extending into the mesogloea of the umbrella and terminating in a short apical stalk, which does not reach to the ex-umbrella.

On the margin of the umbrella, two opposite, perradial tentacles, with a pair of cirri at the base of each; two opposite, perradial

bulbs, without tentacles, one of the bulbs has a short cirrus; and also four interradial and eight adradial bulbs, without cirri. Eight marginal vesicles, with a single otolith, situated close to the perradial canals.

This medusa is clearly a very early stage, not long liberated from a hydroid. The presence of cirri tends to show that it may develop into a medusa like *Saphenia*, or may bud two more tentacles and become like *Eutima*. As it resembles *Saphenia* in its present condition, I have placed it here until the hydroid form is identified.

At the end of May 1895 I found two specimens in Valencia Harbour. The smaller 4 mm. in diameter. As this medusa has been so little described, I give the characteristic points of the largest specimen (Pl. XVII. fig. 3):—Umbrella 9 mm. in width and 5 mm. in length. Manubrium about 10 mm. long. The two opposite, perradial tentacles about 15 mm. in length, when fully expanded; twelve to fifteen marginal bulbs in each quadrant of the umbrella; the tentacles and all the bulbs with cirri. Eight marginal vesicles with 3–5 otoliths. The medusa is completely colourless, except for a delicate pinkish tinge on the stomach and lips.

Distribution. Scotland—Firth of Forth, *Wright*.

England—Plymouth, *Cunningham*; *Bles*; *Garstang*; *E. T. B.* Isle of Man, *Browne*.

Ireland—Valencia Island, *E. T. B.*

Octorchis gegenbauri, Haeckel.

Octorchis gegenbauri, Haeckel (1864) (1879).

A single specimen of this medusa was taken, for the first time in British Seas, at Plymouth on 7th September, 1895. Only two species—*O. gegenbauri* and *O. campanulatus*—are known and are only recorded from the Mediterranean. The Plymouth *Octorchis* does not correspond exactly to the descriptions given by Haeckel of either the above species, but appears to be an intermediate form, a kind of connecting link between the two species. As it is more like *O. gegenbauri*, I have placed it under that name.

Umbrella bell-shaped, 6 mm. in length and 9 mm. in width. Manubrium when fully expanded 12 mm. long. Peduncle quadrangular, about five times as long as the stomach; mouth with four large, crenate lips. Eight tentacles (4 perradial and 4 interradial), about 10 mm. long when expanded, about 2 mm. long when contracted, without cirri at the base. About 60 bulbs, or warts, evenly distributed on the margin of the umbrella, nearly every one with short spiral cirrus. Eight marginal vesicles, adradial, with 6 to 10 otoliths in two rows. On each of the four radial canals, about the middle of the peduncle, there is an oval mass of ova, and also a genital band, probably containing spermatozoa, extending along the radial canals from the base of the peduncle nearly to the margin of the umbrella. Medusa perfectly colourless.

TRACHOMEDUSÆ.

Fam. GERYONIDÆ.

LIRIANTHA APPENDICULATA (Forbes).

Geryonia appendiculata Forbes (1848).
Liriope appendiculata, Gegenbaur (1856); Agassiz (1862).
Xanthea appendiculata, Haeckel (1864).
Liriantha appendiculata, Haeckel (1879).

This medusa was exceedingly abundant at Plymouth during the whole of September and the early part of October, 1893. As most of the specimens belonged to the early stages, I was able to trace its development.

First Stage.—Umbrella sub-globose, from 1 to 2 mm. wide, and about as long. Velum very broad. On the margin of the umbrella there are four interradial tentacles, about half the length of the umbrella, and are usually carried in an upright position alongside the ex-umbrella. On the inner side of these tentacles there are rows of nematocysts, which are directed outwards when the tentacle is alongside the umbrella. These tentacles remain throughout life. On the ex-umbrella, about one-third the distance from the margin, are situated four little, perradial, primary tentacles; each consists of a large cluster of nematocysts upon a short stalk. Within the bulb containing the nematocysts there is a fine whip-like tongue, which I have seen occasionally protruded and after moving rapidly about in every direction withdrawn again inside the bulb. These primary tentacles disappear later in life. The characteristic features of this stage are the primary perradial tentacles and the absence of a manubrium.

Second Stage.—During this stage the manubrium commences to grow downwards, a continuation of the edge of the circular opening in the first stage. At the same time four perradial tentacles commence to grow from the margin of the umbrella. They differ considerably from the interradial tentacles, and are not carried in an upright position, but hang down or trail behind the umbrella when the medusa is in motion and can be extended to a considerable length. Each tentacle has numerous rings of nematocysts. The lateral primary tentacles on the umbrella are usually present, but one or two may be absent. Medusæ belonging to this stage may be characterized by possessing four perradial tentacles on the margin of the umbrella, and a short manubrium, not reaching to the velum. Umbrella about 3 mm. in diameter and colourless.

Third Stage.—This is really the commencement of the adult stage, as the gonads begin to develop upon the radial canals. The lateral tentacles disappear and small scars mark their former position upon the ex-umbrella. The manubrium extends slightly beyond the cavity of the umbrella. Umbrella about 4 mm. in diameter. I have divided the early stages into these three

divisions, as most of the specimens taken could thus be separated in the process of sorting; but the whole collection formed one continuous series.

The Adult Stage.—Forbes first described the adult form from a few specimens which he obtained at Dartmouth (Aug. 31, 1845), at Portland, and about 15 miles off the Devonshire coast. I have not seen any other records of the capture of this medusa. I do not think it is a native of our seas, but rather an occasional visitor. It was very abundant in 1893, but I did not see a single specimen during my visit to Plymouth in September 1895. Its home may be in the Mediterranean or in the warmer parts of the Atlantic. The description given by Gegenbaur of *Liriantha mucronata* from the Mediterranean corresponds very closely to the British species. I do not intend here to give a complete description of the adult, as it may be easily identified from the description and figures given by Forbes. It possesses the usual eight sense-organs ("Hörbläschen"). The heart-shaped generative organs are nearer the margin than Forbes's figures show them to be. Haeckel places great importance upon the *glossoconus* ("Zungenkegel"), which is the conical termination of the peduncle inside the stomach. He divides the genus *Liriantha* into two subgenera, one with and the other without the *glossoconus*. Forbes's *Liriantha* is placed in the subgenus without the *glossoconus*, as Forbes never described it; but I have seen it in the Plymouth specimens. Unless specially looked for, it may be easily passed over.

Mr. E. J. Allen, in a letter from Plymouth dated 9th January, 1896, informs me that specimens of *Liriantha appendiculata* were taken at Plymouth on 7th and 8th of January. It is very interesting to note the occurrence of this medusa in the middle of winter.

NARCOMEDUSÆ.

Fam. SOLMARIDÆ.

SOLMARIS, sp.?

Two early stages of a medusa belonging to this genus were taken about three miles south of Plymouth on 7th September, 1895. The umbrella of the largest specimen about 2 mm. in diameter, with 15 lappets. There is a brownish sense-organ ("Hörkölbchen") in the centre of each alternate lappet. Fifteen tentacles, one between every two lappets. No genital ring present. Umbrella and tentacles colourless. The other specimen, about 1 mm. in diameter, with 14 tentacles, 14 umbrella-lappets, seven sense-organs, one on each alternate lappet. The figure (pl. xx. fig. 7) given by Haeckel of *Solmaris coronantha* is very much like the appearance of the young medusæ taken at Plymouth.

The medusæ belonging to the genus *Solmaris* are not natives of our cold seas. Most of the species inhabit the tropical seas; three, however, have been found in the Mediterranean, and one (*S. coronantha*) off the Canary Islands.

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EXPLANATION OF THE PLATES.

Plate XVI.

Fig. 1. *Corymorpha nutans*, adult ♀, × 10; p. 463. Valencia, 1895.
Fig. 2. *Dipurena*, sp.?, probably a young stage, × 60; p. 473. Plymouth, 1895.
Fig. 3. *Lar sabellarum* (*Willsia stellata*), 1st stage, × 25; p. 468. Plymouth, 1893.
Fig. 4. *Lar sabellarum* (*Willsia stellata*), 3rd stage, × 15; p. 468. Plymouth, 1893.
Fig. 5. *Saphenia mirabilis* (?), an early stage, × 40; p. 493. Plymouth, 1895.
Fig. 5*a*. Diagram of the margin of the umbrella.
Fig. 6. *Phialidium buskianum*, adult, × 8; p. 488. Plymouth, 1895.
Fig. 6*a*. Diagram of the margin of the umbrella.
Fig. 7. *Euchilota pilosella* (?), an early stage, × 25; p. 484. Plymouth, 1895.
Fig. 7*a*. Diagram of the margin of the umbrella.

PLATE XVII.

Fig. 1. *Phialidium cymbaloideum*, earliest free-swimming stage; p. 491. Valencia, 1895.
Fig. 2. *Phialidium cymbaloideum*, adult, × 8; p. 491. Valencia, 1895.
Fig. 2 *a*. Diagram of the margin of the umbrella.
Fig. 3. *Saphenia mirabilis*, an intermediate stage, × 6; p. 493. Valencia, 1895.
Fig. 4. *Phialidium temporarium*, earliest free-swimming stage, × 23; p. 489. Valencia, 1895.
Fig. 5. *Phialidium temporarium*, × 8; p. 489. Valencia, 1895.
Fig. 6. *Phialidium temporarium*, adult, × 6; p. 489. Port Erin, 1894.

3. On some Extinct Fishes of the Teleostean Family *Gonorhynchidæ*. By A. SMITH WOODWARD, F.Z.S.

[Received March 13, 1896.]

(Plate XVIII.)

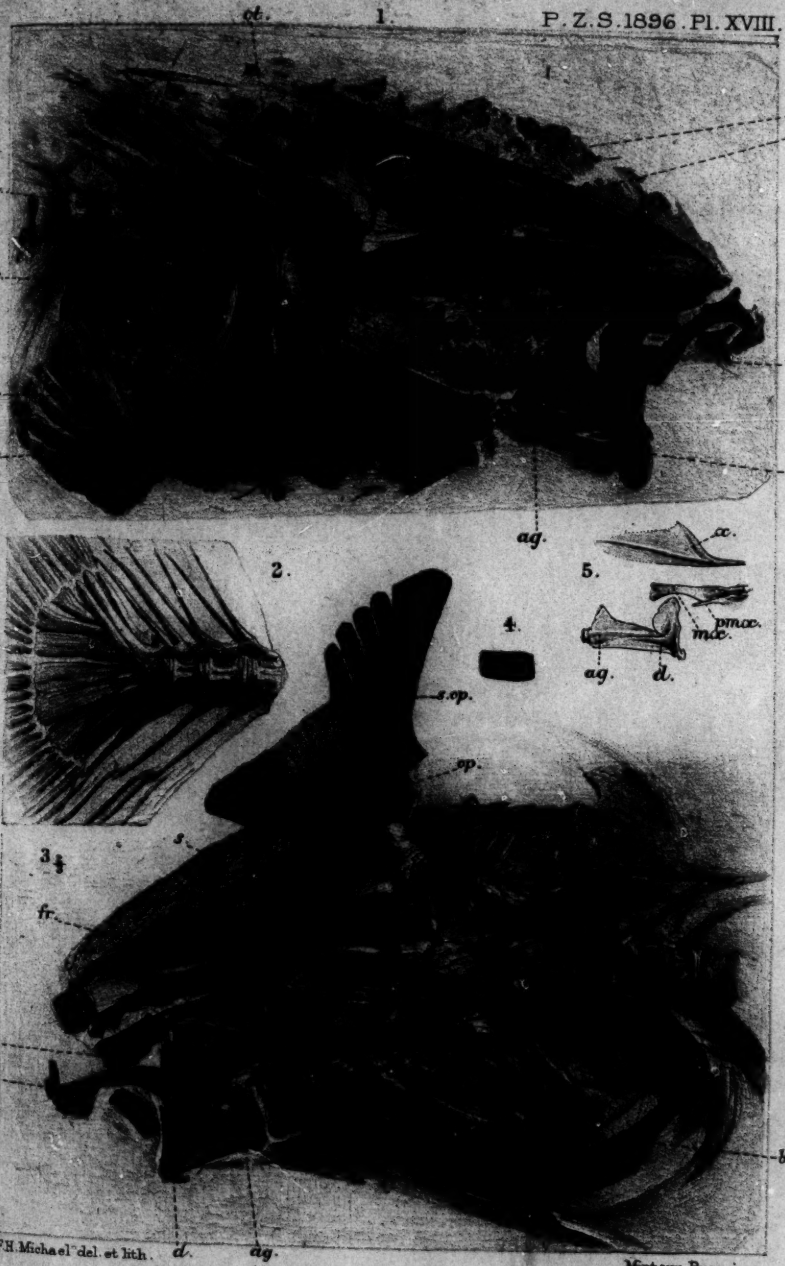
In his well-known work 'Recherches sur les Ossemens Fossiles' Baron Cuvier describes several fossil remains of fishes from the Upper Eocene gypsum of Montmartre, near Paris, which he briefly discusses with only provisional results and no definite names. Most of these have been redescribed by subsequent observers, who have had additional specimens and more satisfactory materials for comparison; and the systematic position of some of them is now determined with a considerable degree of certainty. One nearly complete specimen, however, which still remains *incertæ sedis*, has not hitherto received the attention it deserves; for it and a closely-allied form from the Eocene marls of Aix-en-Provence seem to belong to a nearly extinct family of Teleosteans (Gonorhynchidæ) which has not previously been known to occur in the European area.

This fossil is first described in the second edition of the work in question (1822), and exhibits remains of all the skeletal parts of a fish about 0·2 m. in length. As Cuvier himself remarks, the disposition of the fins is very suggestive of that in the "Gonorhynque (*Cyprinus gonorrynchus*, Gron.)"; while "the parts of the head which are observable indicate a Cyprinoid with prominent nose, such as the Gonorhynque, the *Cyprinus nasus* [=*Chondrostoma*], or a similar form." The small mouth, extended premaxillæ, and absence of teeth are also noticed.

A more imperfect example, not improbably of the same species, from Montmartre, had previously been described by de Blainville under the name of *Anormurus macrolepidotus*[1]; and its scales were said to be remarkably similar to those of a larger fish made known at the same time from Aix-en-Provence and referred to a new species of *Cyprinus*, namely *C. squamosseus*. The dorsal fin was described as remote and comprising 14 or 15 rays. The jaws appeared to be toothless, and five broad branchiostegal rays could be counted.

In 1844 the so-called *Cyprinus squamosseus* of de Blainville

[1] Nouv. Dict. d'Hist. Nat. vol. xxvii. (1818), p. 374.



F.H. Michael del. et lith. Mintern Bros. imp.

EXTINCT GONORHYNCHID FISHES.

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became the type of the genus *Sphenolepis* of Agassiz[1], and was then referred to the Esocidæ. The Montmartre specimen described and figured by Cuvier was also placed in the same genus under the name of *Sphenolepis cuvieri*; and since that date both these fishes seem to have been always quoted as related to the genus *Esox*.

A recent examination of the specimens of these two fishes in the British Museum has now convinced the present writer that Cuvier's original comparison of *Sphenolepis cuvieri* with *Gonorhynchus* was correct; that *Sphenolepis squamosseus* certainly belongs to the same genus; and that both these fishes are generically identical with *Notogoneus osculus* from the freshwater Green River Shales (Eocene) of Wyoming, U.S.A., which Professor Cope referred to the Gonorhynchidæ eleven years ago[2]. As the only surviving genus, *Gonorhynchus*, seems to be exclusively restricted to the seas bordering Japan, South Africa, Australia, and New Zealand, the discovery of an extinct freshwater ally both in Europe and America is one of some interest. It is thus important that the principal osteological characters of the known fossils should be clearly stated to justify the comparisons made.

1. Notogoneus osculus. (Plate XVIII. figs. 1, 2.)

1885–86. *Notogoneus osculus*, E. D. Cope, Amer. Nat. vol. xix. p. 1091; Mem. Nat. Acad. Sci. vol. iii. p. 163, pl. with figs. 4, 5.

Formation and Locality. Green River Shales (Eocene); Wyoming, U.S.A.

The North-American form *Notogoneus osculus* has already been well described by Cope, who also publishes a diagrammatic figure. A beautiful new specimen, however, lately acquired by the British Museum, permits the determination of a few additional features.

The head in this fossil, shown of the natural size in Pl. XVIII. fig. 1, is exposed directly from the side, and thus does not exhibit the hinder part of the cranial roof, which is fortunately well seen in the original specimen figured by Cope. The large and characteristic right frontal bone (*fr.*) is distinct, while the upper part of the otic region (*ot.*) is shown to be well ossified, and is evidently not entirely covered by the squamosal. The much-expanded hyomandibular (*hm.*) is exposed, except at its lower end; but the other elements of the suspensorium, as also those of the pterygo-palatine arcade, are too much crushed and fractured to be distinguishable. The articulation for the mandible, however, is distinct below the front border of the orbit, and portions of both rami are preserved, that of the left side thrown upwards a little above the right ramus. Though imperfect the bones here indicated can readily be determined by reference to the corresponding elements in the existing *Gonorhynchus* (Pl. XVIII. fig. 5). The articulo-angular bone (*ag.*) is almost fan-shaped, extending upwards immediately in front of the articulation into a large, bluntly-pointed process. The dentary (*d.*) is much larger than the latter element, truncated in front, with very short oral border, and rising into an enormous upwardly-

[1] Poiss. Foss. vol. v. pt. ii. (1844), p. 87.
[2] American Naturalist, vol. xix. (1885), p. 1091.

directed process. The left maxilla (*mx.*) is completely preserved, slightly arched in form, with a small ascending process near its anterior end, and a little expansion posteriorly. Of the right maxilla only a fragment of the anterior end remains. The premaxillæ are not shown, but the bone labelled "? barbel axis" in Cope's original specimen may be one of them. No teeth are exhibited in any part of the mouth. The preoperculum (*p.op.*) has a large lower limb and is much expanded at the angle. The operculum (*op.*) is imperfect above, but evidently trapezoidal in form and somewhat deeper than broad. The suboperculum (*s.op.*) is deeper behind than in front, and exhibits four deep clefts in the lower half of its hinder border. Small scales can be observed enveloping all the head and opercular bones.

The vertebral centra are much constricted and strengthened with small irregular longitudinal ridges. The ribs are remarkably slender, apparently supported by stout processes from the centra; while the separate neural spines in the anterior half of the abdominal region are expanded into thin narrow laminæ. The last vertebra of the tail (Pl. XVIII. fig. 2) bears an upwardly-turned double style, and there are seven expanded hæmal arches at the base of the caudal fin, the lowest apparently connected with the penultimate vertebral centrum, the next three with the last centrum, and the upper three with the terminal style. It is also worthy of note that the neural arch in the three vertebræ preceding the last is forked from the base. Intermuscular bones are seen above the vertebral column throughout, and below it in the caudal region.

The fins are as described by Cope, except that the pelvic pair is much larger than indicated in the original specimens. The scales are precisely similar in shape and denticulation to those of the existing *Gonorhynchus*.

2. NOTOGONEUS SQUAMOSSEUS. (Plate XVIII. figs. 3, 4.)

1818. *Cyprinus squamosseus*, H. D. de Blainville, Nouv. Dict. d'Hist. Nat. vol. xxvii. p. 371.

1844. *Sphenolepis squamosseus*, L. Agassiz, Poiss. Foss. vol. v. pt. i. p. 13, pt. ii. p. 87, pl. xlv.

Formation and Locality. Upper Eocene; Aix-en-Provence, France.

The so-called *Cyprinus* or *Sphenolepis squamosseus* is represented in the British Museum by several specimens, which, taken together, display nearly all its essential characters. The head with opercular apparatus is relatively much larger than in *Notogoneus osculus*, its length exceeding the maximum depth of the trunk, and contained only about four times in the total length of the fish; the vertebral centra are also much shorter; otherwise its specific characters seem to be identical with those of the American fish.

The best-preserved head belongs to a specimen wanting part of the abdominal region and the caudal fin, and is shown of two-thirds the natural size in Pl. XVIII. fig. 3. It is unfortunately very imperfect, but the enveloping small scales (*s.*) are exposed in a narrow band, both above and below. The much-fractured

cranium is seen from above, but the only clearly distinguishable remains are those of the great pair of frontals (*fr.*). Some characteristic portions of the small mouth are observable forwards below; one of the maxillæ (*mx.*), a dentary (*d.*), and apparently a fractured articulo-angular element (*ag.*) being distinct. The bone (*x*) above the maxilla may perhaps be part of the large preorbital cheek-plate seen in *Gonorhynchus* (fig. 5). The right operculum (*op.*) and suboperculum (*s.op.*) are displaced upwards above the head, and the last-mentioned bone exhibits the four deep clefts in its hinder border. Remains probably of four large branchiostegal rays (*br.*) occur below the head just in front of the rather obscure pectoral arch.

The total number of vertebræ cannot be definitely ascertained, but seems to be between 50 and 60. The centra resemble those of the American fish, though a little shorter in proportion to their depth; and the state of preservation of one specimen (Brit. Mus. no. P. 3884) suggests that each centrum was pierced mesially by the notochord. The delicate ribs are borne by stout processes from the centra, as noted by Agassiz, and as well shown in the specimen of which the head has been described. The neural spines are expanded in the anterior part of the abdominal region, as also shown in the same specimen and indicated by Agassiz in fig. 3 of his plate representing the species. The extremity of the vertebral column is formed precisely as described above in *N. osculus*, the lowermost expanded hæmal spine at the base of the caudal fin being distinctly supported by the hinder border of the penultimate centrum; this, however, must be displaced forwards, for both the penultimate and the antepenultimate centrum bears its own hæmal arch, comparatively stout but not expanded.

The fins appear to resemble those of *N. osculus*, but there are only eleven supports in the dorsal (clearly shown in Brit. Mus. no. 43436), the foremost with a wing-shaped expansion indicating its composite character. It is difficult to count the rays themselves, the two halves of each being so loosely apposed that in crushing they frequently slip one behind the other.

The scales are comparatively thick, and in their crushed state they rarely exhibit the posterior fringe of denticles. Careful examination of many specimens, however, shows that they precisely resemble those of *Gonorhynchus*. A detached scale from the hinder end of the caudal region is represented of the natural size in Pl. XVIII. fig. 4. The radiating grooves in its deeply overlapped portion are distinct, and the hinder fringe is partly restored from an adjoining scale.

3. Notogoneus cuvieri.

(?) 1818. *Anormurus macrolepidotus*, H. D. de Blainville, Nouv. Dict. d'Hist. Nat. vol. xxvii. p. 374.

1822. "Cyprin," G. Cuvier, Oss. Foss. ed. 2, p. 346, pl. lxxvii. fig. 15.

1844. *Sphenolepis cuvieri*, L. Agassiz, Poiss. Foss. vol. v. pt. i. p. 13, pt. ii. p. 89, pl. xliv. figs. 1, 2 (? figs. 4–12, *nec* fig. 3).

Formation and Locality. Upper Eocene (Gypsum); Montmartre, Paris.

This is a smaller and more slender species than either of the above, and the single specimen of it in the British Museum adds only one new fact to the description by Cuvier and Agassiz. The remains of the squamation above and behind the anal fin distinctly prove that the scales are identical with those of *Gonorhynchus* and *Notogoneus*, not only in form, but also in their characteristic posterior denticulation.

It must, however, be remarked that the large head provisionally ascribed to this species by Agassiz is proved by its large dentigerous mandible to belong to a distinct fish; while the other fragmentary remains placed here are at least problematical.

. . . . . .

The three fishes thus briefly noticed are so closely similar to the recent *Gonorhynchus* that it is difficult to realize their dating back to the earliest Tertiary period; but their interest becomes even greater when it is remembered that the three formations yielding their remains are proved by other associated fossils to be of fresh-water origin. So far as known, indeed, these Eocene fishes can only be distinguished generically from *Gonorhynchus* by three characters. Firstly, they seem to be entirely toothless, whereas the recent fish has large teeth on the pterygoid and hyoid bones. Secondly, their suboperculum exhibits some deep clefts in its hinder border. Thirdly, their dorsal fin is in the middle of the back, while that of *Gonorhynchus* is much more remote. The extinct freshwater Gonorhynchid of France and Wyoming thus requires a distinctive generic name, and there are three from which to select, namely, *Anormurus* (Blainville, 1818), *Sphenolepis* (Agassiz, 1844), and *Notogoneus* (Cope, 1885). The first was too imperfectly defined for recognition, while the second is pre-occupied (*Sphenolepis*, Nees, 1834); *Notogoneus* may therefore be adopted as in the foregoing notes.

EXPLANATION OF PLATE XVIII.

Fig. 1. *Notogoneus osculus*; right lateral aspect of head and opercular apparatus.—Eocene; Wyoming, U.S.A. *ag.*, articulo-angular; *d.*, dentary; *fr.*, frontal; *hm.*, hyomandibular; *mx.*, maxilla; *op.*, operculum; *ot.*, otic region; *p.op.*, preoperculum; *s.*, scales; *s.op.*, suboperculum. [P. 7491.]

Fig. 2. Ditto; three terminal vertebræ and hypural of same specimen.

Fig. 3. *Notogoneus squamosseus*; left lateral and partly superior aspect of imperfect head and opercular apparatus, two-thirds nat. size. Upper Eocene; Aix-en-Provence. *br.*, branchiostegal rays; *x*, preorbital cheek-plate; other letters as above. [8052.]

Fig. 4. Ditto; scale of caudal region of same specimen.

Fig. 5. *Gonorhynchus greyi*; right mandibular ramus, upper jaw, and preorbital cheek-plate of recent fish: *pmx.*, premaxilla; other letters as above.

Unless otherwise stated the figures are of the natural size. The numbers in square brackets refer to the Register of the Geological Department, British Museum, where the fossils are preserved.

April 21, 1896.

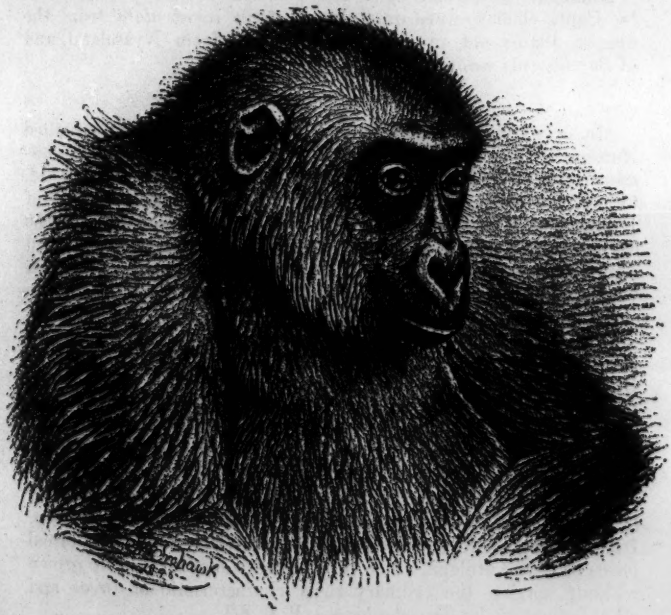
Sir W. H. Flower, K.C.B., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of March 1896:—

The registered additions to the Society's Menagerie during the month of March were 86 in number. Of these 33 were acquired by presentation, 38 by purchase, 3 were born in the Gardens, 8 were received on deposit, and 4 in exchange. The total number of departures during the same period, by death and removals, was 83.

Amongst these special attention was called to:—

1. A fine young female Gorilla (*Anthropopithecus gorilla*), purchased March 6th. This animal (brought home by one of the African Steamship Company's vessels to Liverpool) was obtained at N'gove or Iquela in French Congoland. It is apparently from three to four years old, and is in excellent condition and fairly tame and good-tempered. The only specimen of the Gorilla previously living in the Society's Gardens was the young male acquired in 1887 (see P. Z. S. 1887, p. 559).



Head of female Gorilla, drawn by Frohawk.
(Reduced from 'Field,' vol. lxxxvii. p. 481, 1896, by kind permission.)

2. A young male Markhoor (*Capra megaceros*), from the vicinity of Peshawar, British India, presented by Col. Paterson, March 18th.

3. A pair of a rather scarce species of Duiker Antelope (*Cephalophus coronatus*), from West Africa, received in exchange, March 23rd.

4. A Silver-backed Fox (*Canis chama*), from Cape Colony, presented by C. W. Southey, Esq., of Culmstock, Schoombie Station, South Africa.

Mr. Sclater exhibited some of the specimens from Nyasaland lately sent home by Sir H. H. Johnston, K.C.B., to be transmitted to the British Museum. Amongst these was a very fine head of a male Sable Antelope (*Hippotragus niger*), from the Zomba Plains, of which the horns measured 39 inches along the curve; and a fine specimen of a peculiar form of the Brindled Gnu (*Connochætes gorgon*), shot at the south end of Lake Chilwa by Mr. H. C. McDonald, of the British Central African Administration. This was believed to be the first example of the Gnu sent home from British East Africa.

Amongst the birds sent on this occasion (as kindly determined by Capt. Shelley) were examples of *Grus carunculata* from the Shirwa Plains, not previously transmitted from Nyasaland, and of *Sarcidiornis melanonota* from Lake Shirwa.

Mr. Sclater also exhibited a fine pair of horns of the so-called *Antilope triangularis* (Günther, P. Z. S. 1889, p. 73), *Doratoceros triangularis* (Lydekker, Ann. & Mag. N. H. (6) viii. p. 192; id. 'Field,' lxxviii. p. 130 (1891)), belonging to Mr. Justice Hopley of Kimberley. Mr. Justice Hopley, who had purchased these horns at Kimberley, stated that they were said to have been obtained somewhere on the Zambesi. Mr. Sclater was of the opinion (which was now generally prevalent) that they were abnormal horns of a cow Eland.

[P.S., April 24th.—Since I exhibited these horns I have compared them with the typical specimens of *Antilope triangularis* in the British Museum. There can be no doubt that both pairs belong to the same species of Antelope, but Mr. Justice Hopley's pair are not quite so long, rather more incurved backwards, and less broadly spread; they are also smoother at the base, showing but slight appearances of corrugations.

On comparing these horns, and the portion of the skull attached to them, with the horns of the ordinary female Eland, *Oreas canna*, I see nothing whatever to negative the idea that they are abnormal horns of that Antelope, which for some reason or other have grown without making the ordinary twist characteristic of *Oreas* and other genera of the *Tragelaphinæ*.—P. L. S.]

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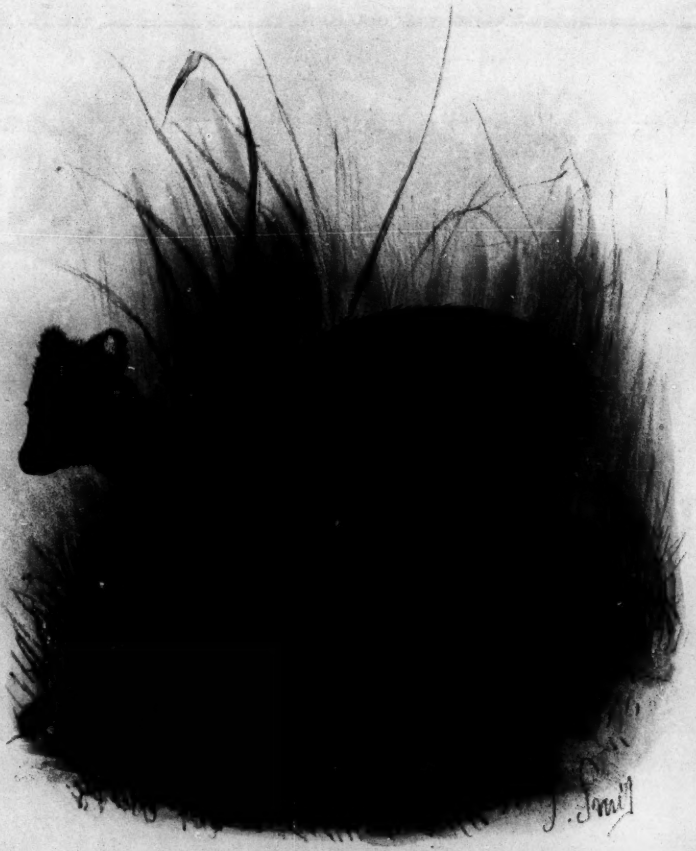

J. Smit del. et lith. Mintern Bros. imp.

PUDUA MEPHISTOPHILES.

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ICTHYOMYS SÖDERSTRÖMI.

Mintern Bros. imp.

The following papers were read :—

1. On some Mammals from Ecuador.

By W. E. de Winton, F.Z.S.

[Received March 17, 1896.]

(Plates XIX. & XX.)

In the absence of Mr. Oldfield Thomas, I have been entrusted by Sir William Flower with the working out of a small collection of mammals from Ecuador, presented to the British Museum by Mr. Ludovicio Söderström, H.M. Consul at Quito. The collection consisted principally of a large number of beautifully prepared bird-skins, chiefly Humming-birds; but though only three mammals were included, these furnish us with a knowledge of two very interesting species new to science. One is a distinct species of small deer of the genus *Pudua*. Since Bennett described the type in the P. Z. S. 1831, p. 27, from a female then living in the Society's Gardens, as *Cervus humilis*, no additional species have been discovered; and as this animal has been found only in the forests of Chili and on the adjacent island of Chiloe, the more northern habitat of an allied species is of special interest. The second specimen in the collection adds a third species to the genus *Ichthyomys*, the curious fish-eating rodents, described by Oldfield Thomas in the P. Z. S. 1893, pp. 337–340, hitherto known only from the great eastern slope of the Andes. The third specimen is one of the well-known Water-Opossum (*Chironectes minimus*), of wide range in tropical South America.

Very little is known of the mammalian fauna of the country from which this collection was made; but we may hope, with the kind assistance of such a good collector and keen naturalist as our present Consul, before long to considerably improve our knowledge, and I have great pleasure in naming one of the species in his honour.

Quito has the distinction of being the highest capital in the world, situated between the Eastern and Western Cordilleras in a lofty valley about 9000 feet above sea-level. The Paramo of Papallacta, whence the new Pudu comes, lies east of Quito, only just south of the Equator, and forms the roof of the great Amazonian water-shed: it is a vast tableland about 11,000 feet above the sea, with mountains of between 18,000 and 19,000 feet to north and south of it; these are the summits of the Eastern Cordilleras and are mostly active volcanoes. The Rio Machangara, where the *Ichthyomys* was obtained, is the stream upon which Quito is built; it joins the Rio de San Pedro a little further north, and this river, draining the valley between the two ranges, is thence known as the Guallabamba, which, cutting through the Western Cordilleras, flows into the Pacific Ocean. The Opossum comes from the banks of the Nanegal River, which is to the west of Quito and joins the Guallabamba lower down, its course being entirely on the west of the Cordilleras.

1. PUDUA MEPHISTOPHILES, sp. n. (Plate XIX.)

The hair of the body is long and coarse, its basal portion peculiarly brittle and pith-like; the terminal half is black with ferruginous tips, producing a rich brown colour. The dorsal region is darker than the flanks, owing to the hairs having broader black bands with correspondingly reduced coloured tips; on the neck the tips are paler and longer, the black being much reduced, which gives a tawny appearance; towards the head the black again increases, till the shorter hairs of the ears, face, and chin are almost black. The ears are thickly covered inside and out with hair, that on the inside being broadly tipped with white. The fore and hind-feet are black, most of the hairs being minutely tipped with buff; the inner sides of the legs and the abdomen are clothed with long yellowish hair of a finer and more ordinary character. There is no turn in the hair of the face, the hair growing upwards from the nose. The ears are very short and partially concealed by the rough hair. The rhinarium from the nostrils down is deep. Tail entirely wanting.

Measurements from skin (type ♀ juv. no. 96, i. 28. 3, in Brit. Mus.):—

Height at withers, about	320	millim.
Length of hind foot (without hoof)	136	„
„ ear	53	„

With the measurements of the skull I give those of the adult female described by Bennett, P. Z. S. 1831, p. 27, for comparison, so far as it is possible, the basal portion of the skull being unfortunately damaged.

Table of Measurements.

	P. mephistophiles.	*P. humilis.*
	millim.	millim.
Greatest length, in straight line [points of p.mx. to base]	160	—
Greatest breadth [across zygomatic process of squamosal]	75	61
Nasals, greatest length	41	40
„ „ breadth	22	16·5
Points of premaxillæ to end of nasals	27	28
Breadth of antenarial opening	16	14
Point of premaxilla to anterior rim of orbit	72	64
Antorbital fossa, breadth	10	8
„ „ length	15	14
Basifacial length	102	—
Basicranial „	39	—
Length of molar series	50	45
Distance between p.ms.^{1}	23	19·5
„ „ ms.^{1}	29	28·5
„ „ ms.^{3}	34	27
Front of molar series to point of premaxilla	46·5	38·5
Palatal incisive foramina, length	19	20
„ „ „ breadth	12	10

Mandibles missing.

Hab. Paramo of Papallacta. Taken by the Indians. Very rare there (*L. S.*).

The general colouring of the animal is very distinct from the type species *P. humilis*, for whereas the latter is a bright chestnut with duller neck and very bright-coloured back, feet, and forehead, the new animal is black-brown sprinkled with fire-red, bright tawny-coloured neck, and almost black head and legs. The ears are very much shorter and are covered with much longer fur especially on the inner side, where they are white, this spot being very conspicuous among the dark surroundings. The tail is wanting, whereas in *P. humilis* it is fully an inch long. It is much to be regretted that the specimen is so young, but I think there can be no doubt that it is very nearly full-grown; the last molar is rising, though the milk-teeth are still unshed. This species is no doubt considerably larger than *P. humilis*, judging by the size of the skull, but I do not think its height can be more than 14 or 15 inches at the shoulder; it is a peculiarly thick-set rough-haired little animal, and looks rather like the kid of a goat with very fine legs.

In the skull the lachrymal pits are very deep, but have sloping sides, not descending nearly so abruptly as in *P. humilis*, in which species this is a very constant character even in quite young individuals. The nasals are very broad and are completely ossified far forward as in *Coassus*. The ascending rami of the premaxillæ rise abruptly, and, expanding very considerably in their upper half, fit into wide notches in the nasals, broader than in any *Coassus* skull which I have examined. The greater length of the molar series amounts to about one tooth, but the most striking difference is the shape of the rows: in *P. humilis* these are always bowed, in most specimens being strongly convergent before and behind, but I have seen one skull in which they do not narrow posteriorly: at the same time they do not widen, though much bowed in front; but in the new species they are set in two almost straight lines, slightly and gradually converging postero-anteriorly as in *Furcifer* and *Coassus*. There are many minor points in which the skull of this animal differs from *P. humilis*, and most of these are characteristic of one or other of the genera mentioned, or of both. The lachrymals and frontals are joined for a greater length, reducing the size of the antorbital vacuities, the lachrymal bone extending over a space 7 mm. wide all round the upperside of the pit; the infraorbital ridge is very thick and is cut off very abruptly, leaving sharp edges above and below; the squamosal portion of the zygomatic arch is more horizontal, not being bowed upwards, as in *P. humilis*. The foramen magnum is very large. The palatal bones differ somewhat in not having side processes extending towards the back of the last molars; the roof of the maxillary portion of the palate is much arched, particularly in the narrow part anterior to the molars: this forms very sharp edges to the sides.

Sir Victor Brooke, in his paper "On the Classification of the

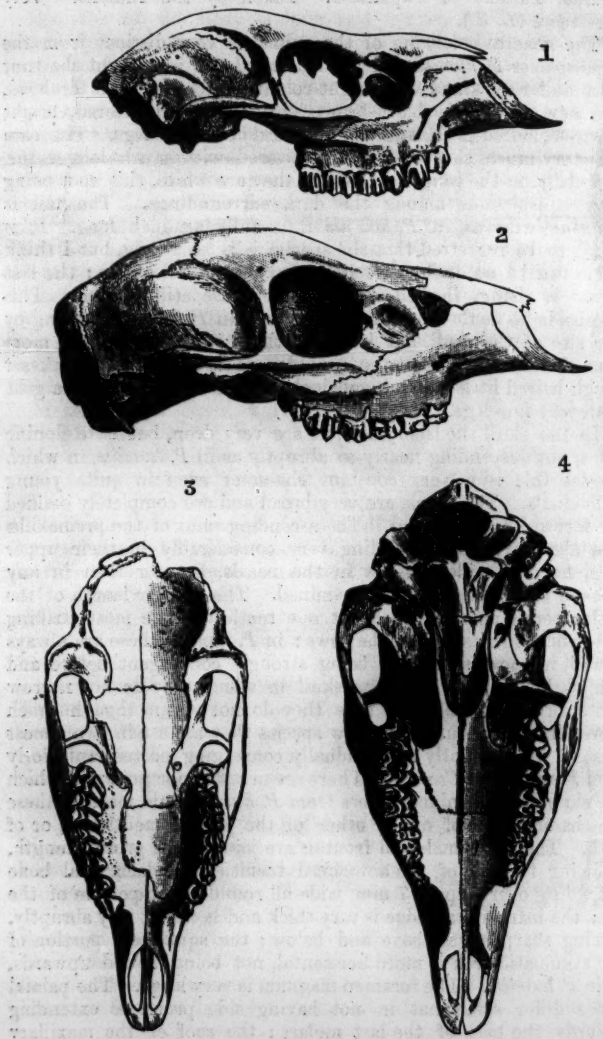

Fig. 1.—Side view of the skull of *Pudua humilis*.
„ 2.—Side view of the skull of *Pudua mephistophiles*.
„ 3.—Palatal view of skull of *Pudua humilis*.
„ 4.—Palatal view of skull of *Pudua mephistophiles*.

Cervidæ," P. Z. S. 1878, p. 926, defining the genus *Pudua*, says "ascending rami of the præmaxillæ reaching the nasals"; I do not know what specimen he had before him, but I cannot find this character in any of the skulls in the collections of the British Museum or of the Royal College of Surgeons; and I should like here to express my thanks to Professor Stewart for kindly placing this latter collection at my disposal. This character has unfortunately been laid down by subsequent writers as distinguishing the genus *Pudua* craniologically from *Coassus*, whereas it is more particularly coassine. Gray, Cat. Mamm. iii. 1852, p. 240, says "Intermaxillary short, not reaching near to the nasal." Garrod, P. Z. S. 1877, p. 13, says "the gap being filled up by the appearance, superficially, of portions of the nasal turbinal." The situation is explained in these two passages, but Professor Garrod ought to have added that the gap is more often filled up by an anteriorly projecting process of the maxilla: I find the space filled up in the two different ways in other genera, and also the premaxilla reaching the nasals, or not, even in members of the same species; there are instances of this in the Museum Collection, in deer both of the Old and New World. I write this to show the worthlessness of this point as a generic or even a specific character; and, indeed, Sir Victor Brooke says he thinks Gray made too much of it; so there is no doubt that if he had examined a larger number he would have seen how extremely variable it is; but having found out as much as he had, I think it is a great pity he followed suit in making so much of this character. I have examined the feet, and osteologically they agree with *P. humilis*, the ectocuneiform and navicular-cuboid bones being all in one.

It will be seen that I have eradicated almost every distinguishing craniological character between this genus and *Coassus*, the much deeper lachrymal pit and the narrower middle incisors (a character I am unable to prove in the new species) alone remaining; so that if this animal is to be retained in the genus *Pudua*, Gray's definition will have to be modified to include both forms of skull as well as the outward differences in structure; but I do not consider these characters of sufficient weight to justify a new genus being formed, for if this were done, the Pudus would have to be placed in a separate subfamily to do fair justice to the osteology of the feet, in which respect they differ so widely from all other New-World Cervidæ; but this could not be justified, seeing that craniologically they are scarcely generically separable from either *Furcifer* or *Coassus*, wide as these two are apart *inter se* in the form of their horns, texture of the coat, and growth of the hair on the face, and in the tarsal tufts. Gray says the Pudus have tarsal tufts; I have failed to find any trace among the specimens in the Museum collection.

The genus *Pudua* may therefore be thus defined:—

New-World group of Cervidæ: Telemetacarpi.

A complete septum divides the nasal cavity into two distinct chambers.

Genus Pudua.

Size very small. Hair coarse and brittle. Horns simple spikes. Metatarsal and metacarpal joints short. Tail very short or wanting. Ears short and rounded. No turn in the hair of the face. Infranarial portion of the rhinarium deep. Canines absent. Middle pair of incisors not broadly spatulate. Ascending rami of the premaxillæ may or may not reach the nasals. Lachrymal pit oval and very deep. Auditory bullæ not inflated. Ectocuneiform and navicular-cuboid bones united. Metatarsal bone not twice and metacarpal bone not $1\frac{1}{3}$ the length of the upper molar series.

2. Ichthyomys söderströmi, sp n. (Plate XX.)

The general colour of the whole of the upper parts dark olive-brown, the main coat of black-brown fur being narrowly tipped or having a subterminal band of dull yellow; thickly interspersed are longer shining black hairs, these being longest on the hind quarters, where they are broadly tipped with silvery white. On parting the fur the only colour found is soft grey, all the main fur having long fine footstalks, so that the whole coat below the surface, save for the few coarse shining hairs, is of a uniformly fine texture and very dense. Ears same colour as the head. The tail, which is thickly haired, is entirely dark brown or black, the fringe of longer hairs on the lower side being of absolutely the same colour; the fore feet are covered with short black hairs, with a few longer white hairs at the base of the claws; the hind feet are black above and below, excepting a few grey hairs round the claws and on the inner side of the tarsus the fringe of stiff hairs is white; the whole of the underparts from the chin to the vent are dirty white, the under-fur being grey and the outer silvery white; the inner sides of the fore and hind limbs are of a more pure white; the whiskers are black or white according to the position in which they grow on the face, those placed high up being black, and there are a few particoloured ones in the middle growth. Palate-ridges 3–3. Mammæ 6: one pair on the breast and two pairs on the belly.

Measurements of type skin (♀ ad. no. 96, i. 28.2, in Brit. Mus.):—Head and body 180 mm. Tail 150 mm. Hind foot 31·5 mm. Ear 8·5 mm. Forearm and hand 31 mm.

Skull.—Greatest length 31·5 mm.; greatest breadth 16 mm. Nasals—length 12 mm.; breadth 3·9 mm. Intertemporal—breadth 4·9 mm. Interparietal—length 2 mm.; breadth 3 mm. Basal—length 29 mm.; basi-facial 18·5 mm.; basi-cranial 10·5 mm. Palate—length 16 mm.; breadth, outside $\frac{\text{m.l}}{\phantom{\text{m.l}}}$ 6 mm., inside $\frac{\text{m.l}}{\phantom{\text{m.l}}}$ 3 mm.; diastema 8·5 mm.; foramina 5·5 mm. Upper molar series—length 4·3 mm. Lower jaw—condyle to incisor tips 20·5 mm.

Hab. Rio Machangara, Ecuador. "Water Rat. Feb. 1895" (*L. S.*).

The skull is remarkably delicate and fragile for such an old animal (the teeth being much worn), and is smaller and narrower

than that of *I. stolzmanni*, the type of which is a very much younger individual; the facial portion is narrower, and there is a marked difference in the shape of the interparietal bones, as will be seen by the measurements: in *I. stolzmanni* this bone forms nearly a perfect parallelogram, while in the new species it is almost diamond-shaped. The zygomatic arch differs considerably, the maxillary processes being broader and standing out at a greater angle; the squamosal process appears rather slighter, but is more horizontal, not drooping so much as in the type species; it will therefore be seen that the "greatest breadth" given of the skulls is the same in both species, though the width across the brain-case is much less in the species now being described.

The mandibles are decidedly smaller, with very small and almost round condylar processes, whereas these are large and oval in *I. stolzmanni*.

In all particulars of structure of feet, ears, and tail this species seems to agree with the type of the genus *I. stolzmanni*, Thomas, P. Z. S. 1893, p. 339; the most conspicuous outward distinction being the difference in the coloration of the tail and feet. I think the make-up of the skin has largely to do with the greater length of head and body in the specimen under consideration, as the size of the feet and measurements of the skull do not bear out the supposition of its being a larger animal.

I am unable to throw any light on the cause of the large infra-orbital foramen; but I can say that no muscles pass through it, and that the nerve seemed very small when relaxed after it reached the Museum in a dry state.

3. Chironectes minimus (Zimm.).

♂ jr. Nanegal; alongside the rivers (no date) (*L. S.*).

2. On the Butterflies of St. Vincent, Grenada, and the adjoining Islands of the West Indies. By F. DuCane Godman, F.R.S., and Osbert Salvin, M.A., F.R.S.

[Received March 27, 1896.]

The collection of Rhopalocera upon which the following notes are based was formed by Mr. Herbert H. Smith in the West-Indian islands of St. Vincent and Grenada and in some of the small islets called the Grenadines, situated between the two larger ones. A few specimens were also obtained from Barbados. Mr. Smith's skill as a collector is well known, and as he spent a considerable time in both St Vincent and Grenada, and visited all parts of each island, we may fairly conclude that the present list embraces the name of nearly every species found in them.

The result proves, we think conclusively, that the Butterfly fauna

is a very poor one, and there is now no likelihood of any important additions being made.

In 1884 (P. Z. S. pp. 314–320) we wrote a short paper on the Rhopalocera of the island of Dominica, and gave an account of the 27 species enumerated, together with a general view of the relationship of the Butterfly fauna of the island to that of the adjoining regions. The present list entirely confirms the conclusions arrived at and points to the great poverty of this portion of the West-Indian fauna. The Danainæ are represented by two species of *Danais*, the Ithomiinæ being wholly absent. Of Nymphalinæ we find only eight species of six genera, all of them more or less common continental species. Heliconinæ are absent, and so are Satyrinæ, Morphinæ, and Brassolinæ. Erycinidæ are unrepresented, but Lycænidæ show eight species, of which we now describe three as new, all of them slight modifications of widely spread southern forms. Of Pierinæ (seven species), *Pieris virginia* is the only one peculiar to the Antilles and is also found in Dominica. The only *Papilio* is apparently *P. eurydamas*, which also occurs in Martinique. Of Hesperiidæ we find thirteen species, and of these we give new names to three, two of which have not been found elsewhere.

Comparing the Butterflies of the two islands, we find little to notice. Grenada has, as might be expected, a slight preponderance of southern forms, of which *Cystineura cana* is an example.

Danainæ.

1. Danais plexippus (Linn.).

Danais plexippus, Biol. Centr.-Am., Rhop. i. p. 1; P. Z. S. 1884, p. 315.

Three examples from St. Vincent (both windward and leeward sides), with white subapical spots, agreeing with South-American specimens.

2. Danais eresimus (Cram.).

A South-American species of wide range, occurring in Hispaniola and Jamaica.

"Swampy forest by the sea-shore north of Granville, Grenada I.; common in this locality. Also Telescope Estate, windward side, April."

Nymphalinæ.

3. Colænis julia (Fabr.).

Several specimens agreeing with South-American examples, having the oblique submarginal dark band on the primaries well developed. The Dominica species is much nearer Cramer's *C. cillene*, but differs in some respects. All these island forms require revision.

"St. Vincent; very common in open lands below 1000 or 1500 feet."

4. AGRAULIS JUNO (Cram.).

Agraulis juno, Biol. Centr.-Am., Rhop. i. p. 170.

Not previously noticed in the West Indies.

"Grand Etang, Grenada, June 2, 1900 feet. Open weedy shore of the lake and edge of the forest." Also St. Vincent, below 1000 feet.

5. AGRAULIS VANILLÆ (Linn.).

Agraulis vanillæ, Biol. Centr.-Am., Rhop. i. p. 171; P. Z. S. 1884, p. 315.

"Balthazar, Grenada, 250 feet, May 25, open weedy place." Also St. Vincent, below 1000 feet.

Found on most of the West-Indian Islands and the greater part of the mainland.

6. JUNONIA CÆNIA, Hübn.

Junonia cænia, Biol. Centr.-Am., Rhop. i. p. 220; P. Z. S. 1884, p. 316.

St. Vincent and Granville, Grenada.

Several specimens agreeing with the northern form found in the Greater Antilles and Central America.

7. ANARTIA IATROPHE (Linn.).

Anartia iatrophe, Biol. Centr.-Am., Rhop. i. p. 221; P. Z. S. 1884, p. 316.

St. Vincent and Granville, Grenada.

"Common in open weedy places below 1000 feet."

8. ANARTIA AMALTHEA (Linn.).

Barbados.

A single specimen of this common South-American species. Not previously noticed from any West-Indian island.

9. CYSTINEURA CANA, Erichs.

Cystineura cana, Schomb. Reise n. Guiana, iii. p. 601.

"St. Vincent; Balthazar, Grenada, May 8, 250 feet, open weedy places; Barbados."

Several specimens agreeing closely with others from British Guiana which are doubtless referable to *C. cana*. The light spots forming a band across the secondaries beneath are smaller and consequently more isolated, and the dark lines across the base of those wings more distinct: otherwise there is little difference.

10. AGANISTHOS ORION (Fabr.).

Aganisthos orion, Biol. Centr.-Am., Rhop. i. p. 324.

Grenada.

Two specimens of this common species, which is also found in Hispaniola, but no other West-Indian island that we know of.

LYCÆNIDÆ.

11. THECLA CYBELE, sp. n.

T. marsyæ (*Linn.*) *similis, sed alis supra omnino cyanescentioribus: subtus maculis nigris omnibus læte albicanti-cæruleo distincte marginatis; anticis area tota ad marginem internum læte cyanea; posticis ad angulum analem cærulescentioribus, macula submarginali nigra intra ramos medianos anguste ovali nec fere rotunda distinguenda.*

♀ *a femina* T. marsyæ *eodem modo differt.*

Hab. St. Vincent.

"Windward and leeward sides Wallibon Valley, 400 to 500 feet, edge of forest, June 10."

This species seems sufficiently distinct from the Continental *T. marsyas* to require a name. Mr. Smith obtained a series of specimens on St. Vincent both on the windward and leeward sides of the island.

12. THECLA PIPLEA, sp. n.

T. pioni *proxima, sed alis subtus saturatioribus; posticis macula coccinea submarginali inter venam medianam et ramum suum secundum multo majore, fasciis duabus maculosis transversis magis approximatis.*

Hab. St. Vincent.

"Scrubby growth on Sufriere Volcano, 2500 feet, Jan. 5–10, near the craters."

This species is closely allied to *T. pion* of Central America (Biol. Centr.-Am., Rhop. ii. p. 56, pl. 54. ff. 28–30), and the male has the small tuft of hair on the upperside of the secondaries near the base of the subcostal nervure characteristic of this group of *Thecla*.

Mr. Smith obtained a series of specimens in good condition.

13. THECLA ANGERONA, n. sp.

T. angeliæ *similis et supra vix differt anticis medialiter vix castaneis; subtus posticis macula submarginali rubra magna, fasciis transversis duabus nigris inter ramos medianos attingentibus.*

Hab. St. Vincent, Grenadines, and Grenada.

"Common all the year in all parts of St. Vincent in open land at the edge of the forest up to 3000 feet. Wallibon Valley, 500 feet, Jan. 10."

"Mount Gay Estate and Balthazar, Grenada; Mustique Island, Grenadines."

Mr. Smith has sent a large series of specimens of this *Thecla*, which appears to be quite common in St. Vincent. It is closely allied to the Cuban *T. angelia*, Hew. (Ill. Diurn. Lep. p. 162, pl. 63. ff. 439, 440).

14. THECLA TELEA, Hew.

Thecla telea, Biol. Centr.-Am., Rhop. ii. p. 82.

"Edge of forest Wallibon Valley, St. Vincent, 500 feet, Jan. 10,"

and "open land near Barronallie, St. Vincent, 500 feet, Jan. 12." "St. George's, Grenada."

Three males and a female of this beautiful little species. The colour of the space between the eyes is dark in some examples and rufous in others, so that this must be considered a variable character. In the tint of the blue of the upper surface of the wings they agree with Central-American specimens rather than with the lighter brighter Amazonian types.

15. THECLA SIMÆTHIS (Drury).

Thecla simœthis, Biol. Centr.-Am., Rhop. ii. p. 81.

Balthazar, Grenada.

Several female specimens agreeing with our mainland series. Drury's type came from the island of St. Christopher.

16. THECLA RUFO-FUSCA, Hew.

Thecla rufo-fusca, Hew. Ill. Diurn. Lep. p. 196, pl. 78. ff. 627, 628; Godm. & Salv. Biol. Centr.-Am., Rhop. ii. p. 91.

"Open land near Barronallie, St. Vincent, 500 feet, Jan. 12."

Several specimens agreeing with the series from Guatemala and Pernambuco referred to in our work.

17. THECLA EURYTULUS (Hübn.).

Thecla eurytulus, Biol. Centr.-Am., Rhop. ii. p. 96.

"Open land near Barronallie, St. Vincent, 500 feet, Jan. 13, and Wallibon Valley, edge of forest, 500 feet, Jan. 10.

"Mount Gay, Granville, Balthazar, St. George's, Grenada."

Many specimens agreeing with our series of this common widely spread species.

18. LYCÆNA HANNO (Stoll).

Lycœna hanno, Biol. Centr.-Am., Rhop. ii. p. 106.

St. Vincent; Mustique and Union Is., Grenadines; Balthazar, Grenada.

Several specimens of this common widely ranging species.

PAPILIONIDÆ.

PIERINÆ.

19. TERIAS LYDIA, Feld.

Terias lydia, Biol. Centr.-Am., Rhop. ii. p. 170.

"Botanical Gardens, Kingstown, St. Vincent, 500 feet, Jan. 20. Open places."

Mount Gay Estate, Balthazar and Granville (Aug. 6), Grenada.

Most of the males of Mr. Smith's series agree with the type of *T. lydia*, Feld., from Venezuela, but one example from St. Vincent differs in having the dark border of the secondaries nearly concentrated at the apical angle, and the submarginal dark line near the inner border of the primaries decidedly narrow; the underside,

too, is more fulvous. We are still reluctant to unite *T. lydia* to the Cuban *T. palmyra*, Poey, but are strongly of opinion that it will not be possible eventually to keep them separate.

20. TERIAS LIMBIA, Feld.

Terias limbia, Biol. Centr.-Am., Rhop. ii. p. 164.

Terias deva, Bates, Journ. Ent. i. p. 240; Godm. & Salv. P. Z. S. 1884, p. 317.

"St. Vincent below 1000 feet, common in open places; Mount Gay Estate above 500 feet, Sept. 15; Granville, Grenada; Barbados."

21. TERIAS ALBULA (Cram.).

Terias albula, Biol. Centr.-Am., Rhop. ii. p. 166.

"St. Vincent, Wallibon Valley, 500 feet, Jan. 10, edge of forest, also near the sea-level."

22. PIERIS VIRGINIA, Godt.

Pieris virginia, Godm. & Salv. P. Z. S. 1884, p. 317.

"St. Vincent, Rabacca Estate, near the sea-level, Jan. 2, rare."

A male agreeing with the specimens from Dominica referred to in our notes on the Butterflies of that island.

23. PIERIS MONUSTE (Linn.).

Pieris monuste, Biol. Centr.-Am., Rhop. ii. p. 132.

Union I., Grenadines; Granville, Grenada.

These specimens do not quite agree with the variable *P. monuste* of the continent; the secondaries beneath, especially in one of the females from Union Island, are strongly tinged with ochre, thus showing a variation in the direction of *P. virginia*.

24. CALLIDRYAS EUBULE (Linn.).

Callidryas eubule, Biol. Centr.-Am., Rhop. ii. p. 141.

"St. Vincent, below 1000 feet, common in open places; Mustique I., Union I., Grenadines; Grenada, Mount Gay Estate, Granville; Barbados."

25. PHŒBIS ARGANTE (Fabr.).

Phœbis argante, Biol. Centr.-Am., Rhop. ii. p. 144.

"Union I., Grenadines; St. Vincent, Caliveny Estate, scrubby growth on hillsides near the sea-level."

PAPILIONINÆ.

26. PAPILIO EURYDAMAS, Roger.

Papilio eurydamas, Roger, Bull. Soc. Linn. Bordeaux, i. p. 36 (1826).

"St. Vincent, 3500 feet, pretty common; Balthazar, Grenada, 250 feet, March 23."

A male and two females agreeing fairly with Roger's description,

but their determination cannot be considered final until they are compared with Martinique specimens, whence Roger's types came. In Dominica another form (*P. neodamas*, Lucas) is found (see P. Z. S. 1884, p. 318), differing *inter alia* in the greenish-yellow band of the secondaries crossing nearer the middle of the wings and away from the outer margin.

Hesperiidæ.

27. Eudamus proteus (Linn.).

Eudamus proteus, Biol. Centr.-Am., Rhop. ii. p. 277.
Thymele proteus, Godm. & Salv. P. Z. S. 1884, p. 318.

St. Vincent; Mustique I., Grenadines; Granville and Mount Gay Estates, Grenada.

28. Eudamus santiago, Lefebv.

Eudamus santiago, Godm. & Salv. P. Z. S. 1884, p. 318.

"St. Vincent, very common in open places 2000 to 3000 feet above sea-level; Union, Mustique, and Canouan Is., Grenadines; Mount Gay, Grenada."

Many specimens agreeing with Dominica examples, and apparently referable to this Cuban species.

29. Goniurus talus (Cram.).

Goniurus talus, Biol. Centr.-Am., Rhop. ii. p. 288.

"St. Vincent, windward side, May."

30. Proteides angasi, Godm. & Salv.

Proteides angasi, Godm. & Salv. P. Z. S. 1884, p. 318, pl. 25. fig. 2.

"St. Vincent, rare in open places in the forest up to 1500 or 2000 feet, July."

Several specimens agreeing with the types from Dominica.

31. Acolastus amyntas, Fabr.

Acolastus amyntas, Biol. Centr.-Am., Rhop. ii. p. 304.
Hesperia ? amyntas, Godm. & Salv. P. Z. S. 1884, p. 319.

St. Vincent.

32. Telegonus anausis, sp. n.

Telegonus anaphus, Godm. & Salv. P. Z. S. 1884, p. 319.

T. anapho *similis, sed posticis angulo anali omnino fusco, fulvo minime notato: subtus quoque fere omnino fuscis, lineola brevi fulva submarginali notatis.*

Hab. St. Vincent; Balthazar and Chantilly Estate, Grenada.

This is an island form of the common *Telegonus anaphus* of the Continent, distinguished by the absence of the tawny margin to the anal angle of the secondaries. Besides the series before us from Mr. Smith's collection, we have specimens from Dominica and Hispaniola.

33. Hesperia syrichtus, Fabr.

Pyrgus syrichtus, Godm. & Salv. P. Z. S. 1884, p. 319.

"St. Vincent, the commonest of the Hesperiidæ in open places up to 3000 feet, Richmond Estate, Dec. 14; Union I., Grenadines; Balthazar and Mount Gay Estate, Grenada."

34. Hesperia ? asychis (Cram.).

"St. Vincent; Mustique I., Grenadines; Balthazar, Grenada, roadside 1250 feet, August."

35. Calpodes ethlius (Cram.).

Pamphila ethlius, Godm. & Salv. P. Z. S. 1884, p. 319.

St. Vincent; St. George's, Granville, and St. John's River, Grenada.

36. Calpodes coscinia (H.-S.).

Goniurus coscinia, Herr.-Sch. Corresp.-Blatt. Regensb. xix. p. 54.

"St. Vincent, near Barronallie, 500 feet, open lands, Jan. 13; St. George's, Mount Gay Estate, and Chantilly Estate, Grenada."

37. Prenes eugeon, sp. n.

P. panoquin, *Scudder, affinis sed minor, alis magis ochraceis; anticis minus elongatis, macula hyalina inter ramos medianos fere rotunda, minime sagittiformi: subtus ochraceoribus.*

Hab. Union I., Grenadines; Granville and St. George's, Grenada.

M. Mabille, to whom we sent a specimen of this species, writes to say that it is near to the insect he described as *Pamphila parilis*, which again appears to be close to *P. panoquin*. So far as we can see, the differences pointed out above distinguish it from both these forms. Mr. Smith captured one of his specimens on the sea-shore about a mile from St. George's on 19th October.

38. Hylephila phylæus, Drury.

Pamphila phylæus, Godm. & Salv. P. Z. S. 1884, p. 319.

"St. Vincent, on flowers, open land near Barronallie, 500 feet"; St. George's, Granville, and Mount Gay Estate, Grenada.

39. Hylephila dictynna, sp. n.

Alis rufescenti-fulvis nigro extrorsum marginatis, ciliis fulvis; anticis stigmate obliquo nigerrimo leviter arcuato, ultra illud lineola incerta nigra ad cellulæ finem: subtus rufescenti-fulvis fere unicoloribus, anticis plaga basali et macula ad angulum analem nigris; palpis et pectore ochraceis.

Hab. St. Vincent, common in open places up to 2000 feet; St. George's, Balthazar, Grenada.

Many specimens, all males. *H. vibex* seems to be the most nearly allied species and has the alar brand similarly shaped; but the colour and the absence of spots on the secondaries beneath at once distinguish it.

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3. On some Dragonflies obtained by Mr. and Mrs. Lort Phillips in Somali-land. By W. F. Kirby, F.L.S., F.E.S., &c.

[Received April 21, 1896.]

Two days were devoted by Mr. and Mrs. Lort Phillips during their stay in Somali-land to the capture of Dragonflies, and examples of six species were obtained. Five of these belong to the *Libellulinæ*, and one to the *Æschninæ*; and though three are common and well-known species, I am able to describe the others, which I refer provisionally to the genus *Orthetrum*, as apparently new to science. It is, however, somewhat to be regretted that I have only single specimens before me at present.

1. Pantala flavescens, Fabr.

Dobar, Goolis Mountains, Feb. 4, 1895.
A common species in most parts of the world, except Europe.

2. Trithemis arteriosa, Burm.

Dobar, Goolis Mountains, Feb. 4, 1895.
Bichen, Somali-land, Feb. 5, 1895.
A common African species.

3. Orthetrum brevistylum, sp. n.

Long. corp. 38 millim.; exp. al. 52 millim.; long. pter. 2·7 millim.

Male. Head testaceous, more greenish above, occiput dull orange above, with two black spots on each side; prothorax blackish, but marked with large yellow spots above and on the sides; mesothorax and metathorax olivaceous, slightly pulverulent, especially behind, the former with the front carina and an incomplete shoulder-stripe on each side black; pleura with two oblique glaucous stripes, bordered above with black; abdomen pulverulent blue, with some yellowish markings on the basal segments, which are considerably thickened vertically, central carina black; terminal upper appendages about twice as long as the last segment, very hairy, slightly thickened beyond the middle, and pointed at the extremity; lower appendage very broad, two-thirds as long as the others, and slightly upcurved at the extremity. Legs black above and slightly pulverulent; testaceous below. Wings clear hyaline, even to the base; membranule pure white, edged with black below on the hind wings. Neuration black; the front of the costal nervure, the lower antenodal cross-nervures, and the nodal cross-nervure for two spaces below the upper antenodal space, testaceous. Fore wings with 11–12 antenodal cross-nervures (the last continuous), and 8–9 postnodals, the first 2 or 3 not continuous; nodal sector distinctly waved; space between the nodal and subnodal sectors with two rows of cells towards the hind margin. Sectors of the arculus *springing from a*

point or very short stalk; triangle traversed, 3 rows of post-triangular cells increasing; 3 cells in the subtriangular space; one cross-nervure in the lower basal cell; no supratriangular nervules. Hind wings with the base of the triangle on a level with the arculus; pterostigma yellow, between thick black nervures.

This species much resembles *O. cœrulescens*, Fabr., and, *O. subfasciolatum*, Brauer; but the almost unstalked sectors of the arculus on the fore wings remove it from any of the allied species. It is, however, an *Orthetrum* in its essential characters, and, except in this one particular, exhibits no resemblance to *Leptetrum*. It is curious that of the three new species in the present small collection, none seem to agree exactly with the described genera; and as I am unwilling to establish new genera on single specimens, I place them provisionally in *Orthetrum*, to which they seem perhaps most nearly allied.

4. Orthetrum phillipsi, sp. n.

Long. corp. 35 millim.; exp. al. 51 millim.; long. pter. 2·2–3 millim.

Male. Head greenish, the frontal tubercle darker, and the adjacent parts of the upper orbits, as well as the occipital triangle, black; occiput black above, yellow beneath. Thorax and abdomen wholly pulverulent blue, the sutures and carinæ lined with black, and the front of the mesothorax with incomplete black shoulder-stripes. Abdomen rather slender, moderately inflated at the base. Legs black; the front legs yellowish on the outside, the others with the coxæ and a stripe on the femora yellowish. Lower anal appendage fully $\frac{3}{4}$ as long as the upper ones. Wings narrower than in the last species, clear hyaline, the base stained with yellow, especially on the hind wings; membranule white, not bordered with blackish below. Neuration and pterostigma coloured as in the last species; nodal sector and space between the nodal and subnodal sectors similar. Fore wings with 11 antenodal cross-nervures, the last continuous, and 8 postnodals, the first two at least not continuous; sectors of the arculus distinctly stalked; triangle traversed, 3 rows of post-triangular cells increasing; 3 cells in the subtriangular space; one supratriangular nervule. Hind wings with the base of the triangle distinctly within the level of the arculus.

An unusually slender species, much resembling the last superficially, but very distinct.

Dobar, Goolis Mountains, Feb. 4, 1895.

5. Orthetrum lorti, sp. n.

Long. corp. 32 millim.; exp. al. 55 millim.; long. pter. 4 millim.

Female. Head greenish yellow, the mouth and lower parts darker. Thorax greenish yellow, with a yellowish-white stripe on each shoulder, bordered below by a darker greenish-brown space than the rest of the coloration. Abdomen moderately short and broad, tawny, with a black central carina commencing on the

third segment, and expanded into a spot in the middle of the eighth; there is also an indistinct brown stripe on each side of the abdomen. Legs testaceous, with blackish spines, and the tibiæ shading into dark brown towards the extremity. Wings hyaline, with brown nervures, the cross-nervures towards the costa, and the costal and subcostal nervures between the nodus and the pterostigma, yellow. Base strongly tinged with yellow on the hind wings, but only slightly so on the fore wings. Pterostigma very long, yellow, between slender black nervures. Fore wings with 11 antenodal cross-nervures, the last not continuous, and 9–10 postnodal cross-nervures, the first two not continuous; the nodal sector very slightly waved, and the row of cells below only doubled for the last 2 or 3 before the hind margin. Sectors of the arculus distinctly stalked; triangle traversed, followed by three rows of cells increasing; three subtriangular cells; one cross-nervure in the lower basal cell; no supratriangular cells. Hind wings rather broad at base, with the base of the triangle on a level with the arculus.

Dobar, Goolis Mountains, Feb. 4, 1895.

There seems no reason to regard this insect as the female of either of the foregoing. It differs from typical *Orthetrum* in the last antenodal cross-nervure being discontinuous.

6. HEMIANAX EPHIPPIGER, Burm.

Bichen, Somali-land, Feb. 5, 1895.

A common species in the warmer parts of the Old World.

4. List of Lepidoptera collected in Somali-land by Mrs. E. Lort Phillips. By EMILY MARY SHARPE.

[Received April 21, 1896.]

Mrs. E. Lort Phillips accompanied her husband on his recent expedition to the Goolis Mountains in Somali-land, in the spring of 1895, and formed a collection of Butterflies which have furnished an interesting supplement to that made by Dr. Donaldson Smith during his recent travels in Somali-land. For a full account of the country traversed by Mr. Lort Phillips, I must refer my readers to the paper published by the last-named gentleman on the Birds obtained during the expedition (*cf.* 'Ibis,' 1896, pp. 62–87, pl. ii.).

Family DANAIDÆ.

1. LIMNAS CHRYSIPPUS (L.).

a. ♂. Gotten, April 6. *b*. ♀. Dobar, Goolis Mts., Feb. 4.

2. LIMNAS DORIPPUS (Klug).

a. ♀. Dobar, Feb. 4. *b*. ♂. Dara-as, March 5.

3. Limnas klugii, Butler.

a, *b*. ♂. Dobar, Feb. 4. *c*. Hammer, Feb. 13. *d*, *e*. ♂ ♀. Gotten, April 7.

Family Satyridæ.

4. Amecera maderakal (Guér.).

a. Hammer, Feb. 13.

5. Ypthima doleta, Kirby.

a. Bichen, Feb. 5. *b*. Gellokur, Feb. 9. *c*. Dara-as, March 8. *d*. Darra-surree, March 13.

Family Acræidæ.

6. Acræa chilo, Godman.

a. ♂. Gellokur, Feb. 9. *b*, *c*. ♂; *d*. ♀. Hammer, Feb. 13. *e*, *f*. ♀. Gotten, April 6.

7. Acræa bræsia, Godman.

a. Gotten, April 7.

8. Acræa sganzini, Boisd.

a. Gotten, April 6.

9. Pardopsis punctatissima (Boisd.).

a–*e*. Hammer, Feb. 13. *f*. Wardi, Feb. 25. *g*. Dara-as, March 5. *h*. Woob, March. *i*. Gotten, April 6.

Family Nymphalidæ.

10. Pyrameis cardui (L.).

a, *b*. Wataba, April 7.

11. Junonia clelia (Cram.).

a. Dobar, Feb. 4. *b*, *c*. ♂; *d*. ♀. Hammer, Feb. 10. *e*, *f*. ♂ ♀. Gotten, April 7.

12. Junonia crebrene, Trimen.

a, *b*. ♂ ♀. Bihen-andola, Feb. 8. *c*, *d*. ♂ ♀. Dara-as, March 6. *e*. ♂. Gotten, April 7.

13. Precis sesamus, Trimen.

a–*d*. Dara-as, March 5. *e*. Darra-surree, March 13.

14. Precis amestris (Drury).

a. Dara-as, March 5. *b*. Darra-surree, March 13.

15. Precis calescens (Butler).

a, *b*. Wardi, Feb. 25. *c*. Dara-as, March 5.

16. Precis taveta, Rogenh.

a–c. Dara-as, March 5. *d*. Gotten, April 6.

17. Byblia ilithyia (Drury).

a, *b*. Hammer, Feb. 13. *c*. Dara-as, March 5.

18. Byblia castanea (Butler).

a. Dara-as, March 5.

19. Hypolimnas misippus (L.).

a, *b*. ♂. Bihen, Feb. 5. *c*. ♀. Dara-as, March 5. *d*. ♀. Woob, March. *e*, *f*. ♂. Gotten, April 7.

20. Charaxes castor (Cram.).

a, *b*. Dara-as, March 5.

Family Lycænidæ.

21. Lycæna moriqua (Wallengr.).

a. ♂. Wardi, Feb. 25. *b*, *c*, *d*. ♂; *e*. ♀. Darra-surree, March 12.

22. Lycæna bætica (L.).

a. Dara-as, March 5.

23. Lycæna lingeus (Cram.).

a, *b*. Wardi, Feb. 25.

24. Lycæna gaika (Trimen).

a. Gellokur, Feb. 9. *b*, *c*. Hammer, Feb. 13.

25. Lycæna knysna, Trimen.

a, *b*. Gellokur, Feb. 9. *c*. Hammer, Feb. 13. *d*. Dara-as, March 5.

26. Lycæna trochilus (Frey.).

a. Bihen-andola, Feb. 7. *b*. Darra-surree, March 13.

27. Tarucus theophrastus (Fabr.).

a. ♂. Dobar, Feb. 4. *b*. ♀. Hammer, Feb. 13.

28. Lycænesthes, sp.

a. Hammer, Feb. 13.

29. Lycænesthes, sp.

a, *b*. Hammer, Feb. 13.

30. Lycænesthes amarah (Guér.).

a. Dobar, Feb. 4. *b*. Dara-as, March 5.

31. Castalius lactinatus, Butler.

a. Bihen-andola, Feb. 8. *b*, *c*. Dara-as, March 5.

32. Tatura umbrosa (Butler).

a. Darra-surree, March 13.

33. Tatura philippus (Fabr.).

a. Gotten, April 7.

34. Deudoryx livia (Klug).

a. Dobar, Feb. 4. *b*. Darra-surree, March 13.

35. Deudoryx anta (Trimen).

a. Hammer, Feb. 13. *b*. Woob, March.

36. Spindacis somalina, Butler.

a. Bihen-andola, Feb. 8. *b*. Hammer, Feb. 13.

37. Callipsyche lara (L.).

a. Darra-surree, March 13.

38. Argiolaus silas (Westw.).

a. Woob, March.

39. Alæna johannæ, E. M. Sharpe.

a, *b*, *c*. Woob, March. *d*, *e*. Dara-as, March 5. *f*, *g*. ♂ ♀. Darra-surree, March 13. *h*. Wataba, April 7.

Family Pieridæ.

40. Terias zoe (Hopff.).

a, *b*. Dara-as, March 5. *c*, *d*. ♂ ♀. Darra-surree, March 12.

41. Terias brigitta (Cram.).

a. Dara-as, March 5.

42. Terias ceres, Butler.

a. Hammer, Feb. 13. *b*. Sahana-sahada, Feb. 17.

43. Mylothris agathina (Cram.).

a–*c*. Dara-as, March 5. *d*. Darra-surree, March 13. *e*. Dooloob, March. *f*. Gotten, April 6.

44. Pieris infida, Butler.

a. ♂. Hammer, Feb. 13. *b*, *c*. ♂ ♀. Dara-as, March 5.

45. Pieris gidica, Godt.

a, *b*. ♂ ♀. Bihen-andola, Feb. 8. *c*. ♂. Darra-surree, March 14.

46. Herpænia melanarge, Butler.

a, *b*, *c*. Bihen-andola, Feb. 8. *d*, *e*. Hammer, Feb. 15.

47. Idmais castalis, Staud.

a. ♀. Dara-as, Feb. 5.

48. Teracolus calais (Cram.).

a–g. Bihen-andola, Feb. 8.

49. Teracolus chrysonome (Klug).

a. Dedjainio, March 29.

50. Teracolus arne (Klug).

a–c. ♂ ♀. Dobar, Feb. 4. *d–f*. ♂ ♀. Gellokur, Feb. 9. *g*. ♀. Dara-as, March 5.

51. Teracolus protomedia (Klug).

a. Bichen, Feb. 5.

52. Teracolus hætera (Gerst.).

a. ♂. Dobar, Feb. 4. *b, c*. ♂ ♀. Dara-as, March 6. *d, e*. ♀. Darra-surree, March 13.

53. Teracolus lorti, sp. n.

Allied to *T. hetæra*, Gerst., and *T. puniceus*, Butler.

This species is smaller than either of the allied forms, but the crimson apical patch is very much larger.

Fore wing. Costa, basal area greyish; the hind marginal border black suffused with grey; veins distinctly black. The crimson patch near the apex commences just above the discoidal cell, extending to the second median nervule.

Hind wing. Rather more grey at the base, the veins black, but having no black spots on the marginal border as in *T. hetæra*.

Underside similar to *T. jobina*, Butler.

Expanse 2·3 inches.

The females are represented in the red and white varieties. They resemble the female of *T. puniceus*, but differ in having a row of three hastate marks on the apical portion of the fore wing. The black marginal border on the hind wing is not so heavily marked as in *T. puniceus*.

Underside similar to that of above-mentioned species, but somewhat redder. It is most likely a dry-season form.

Expanse 2·1 inches.

a. ♂. Dara-as, Goolis Mts., March 5, 1895.

b, c. ♀. Darra-surree, March 13, 1895.

54. Teracolus miles, Butler.

a, b. ♂. Bihen-andola, Feb. 8. *c*. ♀. Hammer, Feb. 13. *d*. ♂. Wardi, Feb. 25. *e*. ♀. Dedjainio, March 29.

55. Teracolus evenina (Wallengr.).

a–c. ♂. Gellokur, Feb. 9. *d*. ♀. Wardi, Feb. 25. *e*. ♀. Gotten, April 6.

56. Teracolus theogone (Boisd.).

a. Hammer, Feb. 13.

57. Teracolus nouna (Lucas).

a, *b*. ♂ ♀. Hammer, Feb. 13. *c*, *d*. ♂ ♀. Wardi, Feb. 25. *e f*, *g*. ♂; *h*. ♀. Dara-as, March 5.

58. Teracolus ignifer, Butler,

a, *b*. Dara-as, March 3.

59. Teracolus phillipsi, Butler.

a–c. ♂; *d*. ♀. Gellokur, Feb. 9.

60. Teracolus leo, Butler.

a. ♂. Bihen-andola, Feb. 8.

61. Colias electra (L.).

a, *b*. ♂; *c*. ♀. Dara-as, March 2.

62. Synchloe glauconome (Klug).

a. Bihen, Feb. 5. *b*. Woob, March. *c*, *d*. Dedjainio, March 29.

63. Catopsilia florella (Fabr.).

a–c. Dobar, Feb. 4. *d*. Hammer, Feb. 13. *e*, *f*. Dara-as, March 5.

64. Nepheronia capensis (Hopff.).

a, *b*. Bihen-andola, Feb. 8.

65. Nepheronia arabica (Hopff.).

a. Dobar, Feb. 4. *b*. Hammer, Feb. 13.

Family Papilionidæ.

66. Papilio demoleus, L.

a. Darra-surree, March 14. *b*. Woob, March.

67. Papilio pseudonireus, Feld.

a. ♂. Dara-as, March 5. *b*. Dooloob, March 24. *c*, *d*. ♂ ♀. Gotten, April 7.

68. Papilio antinorii, Oberthür.

a, *b*. ♂; *c*, *d*. ♀. Dara-as, March 7.

Family Hesperiidæ.

69. Sarangesa pertusa (Mabille).

a, *b*. Dara-as, March 5.

70. Gomalia elma (Irvin).

a. Woob, March.

71. Pyrgus vindex (Cram.).

a. Hammer, Feb. 13. *b*. Wardi, Feb. 25. *c*. Darra-surree, March 13.

RHOPALOCERA HETEROCERA.

Family SPHINGIDÆ.

72. LOPHOSTETHUS DEMOLINII, Angas.
a. Dobar, Feb. 4.

73. MACROGLOSSA TROCHILUS, Hübn.
a. Dara-as, March 5. *b*. Darra-surree, March 18.

Family NOCTUIDÆ.

74. SPHINGOMORPHA CHLOREA (Cram.).
a, *b*. Dobar, Feb. 4.

75. GNAMPTONYX VILIS.
a, *b*. Dobar, Feb. 4.

76. CEROCALA, sp.
a, *b*. Dedjainio, March 29.

77. GRAMMODES STOLIDA (Fabr.).
a. Dobar, Feb. 4. *b*. Dedjainio, March 29.

78. POLYDESMA UMBRICOLA, Boisd.
a. Dobar, Feb. 4.

Family AGARISTIDÆ.

79. ÆGOCERA TRICOLOR, Druce.
a, *b*. Gotten, April 6.

80. ÆGOCERA RECTILINEA, Boisd.
a. Dedjainio, March 29.

Family LITHOSIIDÆ.

81. DEIOPEIA PULCHELLA, L.
a, *b*. Bihen-andola, Feb. 8. *c*, *d*. Dara-as, March 5. *e*. Woob, March. *f*, *g*, *h*. Gotten, April 7.

Family GEOMETRIDÆ.

82. STERRHANTHIA SACRARIA (L.).
a. Dara-as, March 5.

Family PYRALIDÆ.

83. NOTARCHA, sp.
a. Gotten, April 6.

Family PSYCHIDÆ.

84. MONDA DELICATISSIMA, Walker.
a. Dara-as, March 5.

5. List of Lepidoptera obtained by Dr. A. Donaldson Smith during his recent Expedition to Lake Rudolf. By Emily Mary Sharpe.

[Received April 21, 1896.]

For the description of the country traversed by Dr. Donaldson Smith through Western Somali-land, I may refer to my father's paper on the Birds collected during the expedition (P. Z. S. 1895, pp. 457–520).

Although but two new species of Butterflies appear to have been obtained, the facts connected with the geographical distribution of many species are of considerable interest.

Family Danaidæ.

1. Tirumala petiverana, Doubl. & Hewits.

1 ex. ♂. Meo, Oct. 25, 1894.

2. Limnas klugii, Butler.

1 ex. ♀. Lafarook, July 7, 1894.
1 ex. ♀. The Haud, July 22, 1894.
7 ex. ♂ ♀. Sheik Husein, Sept., Oct. 1894.

Family Satyridæ.

3. Melanitis bankia (Fabr.).

1 ex. Shebeli, Aug. 30, 1894.

4. Mycalesis perspicua, Trimen.

3 ex. ♂ ♀. Sheik Husein, Sept., Oct.

5. Ypthima doleta, Kirby.

4 ex. Sheik Husein, Sept. 20–26.

6. Neocænyra rufilineata, Butler.

1 ex. Dabulli, Sept. 16.

Family Acræidæ.

7. Acræa menippe (Drury).

1 ex. Sheik Husein, Sept. 20.

8. Acræa neobule (Drury).

1 ex. The Haud, July 23.
2 ex. ♂ ♀. Sheik Husein, Sept. 24.

9. Acræa lycia (Fabr.).

4 ex. Sheik Husein, Sept. 26 to Oct. 3.

10. Acræa doubledayi, Guérin.

3 ex. ♂ ♀. Sheik Husein, Sept. 23–25.

11. Acræa bræsia, Godman.

1 ex. ♀. Sheik Husein, Sept. 27.

12. Pardopsis punctatissima (Boisd.).

1 ex. Luku, Sept. 18.
4 ex. Sheik Husein, Sept. 19.

Family Nymphalidæ.

13. Atella columbina (Cram.).

1 ex. Walenso, Oct. 26.

14. Pyrameis cardui (L.).

2 ex. Berbera, July 4.
1 ex. Argeisa, July 18.
8 ex. Sheik Husein, Sept. 16 to Oct. 2.

15. Junonia boöpis, Trimen.

2 ex. ♂ ♀. Sheik Husein, Sept. 25.

16. Junonia clelia (Cram.).

1 ex. ♂. Darar, Sept. 15.
4 ex. ♂ ♀. Sheik Husein, Sept. 19 to Oct. 2

17. Junonia crebrene, Trimen.

1 ex. ♂. The Haud, July 23.
1 ex. ♂. Stony-brook, Ehrer River, Aug. 19.
5 ex. ♂ ♀. Sheik Husein, Sept. 19 to Oct. 1.

18. Precis sesamus, Trimen.

1 ex. Darro Mountains, Nov. 19.

19. Precis octavia (Cram.).

2 ex. Sheik Husein, Sept. 27.

20. Precis taveta (Rogenh.).

2 ex. Sheik Husein, Sept. 19, 24.

21. Precis cloantha (Cram.).

1 ex. Sheik Husein, Sept. 19.
1 ex. Sheik Mahomed, Oct. 28.
2 ex. Darro Mountains, Nov. 4, 19.

22. Precis micromera, Butler.

2 ex. Sheik Husein, Sept. 26 to Oct. 1.

23. Precis orthosia (Godt.).

4 ex. Sheik Husein, Sept. 26 to Oct. 2.

24. Eurytela dryope (Cram.).

5 ex. Sheik Husein, Sept. 26 to Oct. 2.
1 ex. Darro Mountains, Nov. 18.

25. Eurytela hiarbas (Drury).

2 ex. Darro Mountains, Nov. 6.

26. Byblia ilithyia (Drury).

13 ex. ♂ ♀. Sheik Husein, Sept. 20 to Oct. 2.

27. Neptis agatha (Cram.).

1 ex. Meo, Oct. 25.
1 ex. Darro Mountains, Nov. 19.

28. Neptis marpessa, Hopff.

1 ex. Sheik Husein, Oct. 2.

29. Hamanumida dædalus (Fabr.).

1 ex. Stony-brook, Ehrer River, Aug. 4.
2 ex. Sheik Husein, Sept. 19.

30. Hypolimnas misippus (Linn.).

1 ex. ♂. Stony-brook, Ehrer River, Aug. 19.
5 ex. ♂ ♀. Sheik Husein, Sept. 19 to Oct. 2.

31. Panopea walensensis, sp. n.

Allied to *P. coromana*, Oberthür, but differs in the white markings on the fore wing.

Fore wing.—The two spots on the apical portion are more square in shape; the discal row of white spots, from the inner margin to the third median nervule, are larger in size and only separated by the brown nervules. Two spots, one in the cell, and the second between the third median and second radial nervules, close to the third discocellular nervule, are very distinctly marked. A submarginal row of white spots, commencing above the submedian nervure, and extending, between each nervule, to the third median nervule; these spots are rather more distinct than in *P. coromana*. *Hind wing*: similar to that of the allied species, the submarginal row of white spots being more distinctly marked.

Underside.—White spots more clearly defined, with the submarginal spots mentioned on the upperside well marked. The whole of the basal half of the hind wing white, with eight black spots at the base. A marginal border, pale brown, not so distinct as in *P. coromana*, and with a submarginal row of round white spots between each nervule.

Expanse 2·7 inches.

Hab. Walenso, Oct. 26, 1894.

32. SALAMIS ANACARDII (L.).

2 ex. Walenso, Oct. 26.

33. CHARAXES CANDIOPE (Godt.).

1 ex. Darro Mts., Nov. 4.

34. CHARAXES HOLLANDII, Butler.

3 ex. Walenso, Oct. 26.

35. CHARAXES ZOOLINA (Doubled.).

1 ex. ♂. Sheik Husein, Sept. 20.
1 ex. ♂. Darro Mts., Nov. 4.

36. CHARAXES NEANTHES (Hewits.).

1 ex. Sheik Husein, Sept. 19.

Family LYCÆNIDÆ.

37. ZERITIS PERION (Cram.).

1 ex. The Haud, July 27.

38. DEUDORYX LIVIA (Klug).

1 ex. Ahdeh, July 14.

39. LYCÆNA PULCHRA, Murray.

1 ex. Argeisa, July 18.
1 ex. Shebeli, Sept. 1.
1 ex. Sheik Husein, Sept. 26.

40. LYCÆNA JOBATES (Hopff.).

1 ex. Sheik Husein, Sept. 19.

41. LYCÆNA THEOPHRASTUS (Fabr.).

1 ex. Stony-brook, Ehrer River, Aug. 18.
2 ex. Sheik Husein, Sept. 28 to Oct. 2.

42. CATOCHRYSOPS ASTERIS (Godt.).

1 ex. Sheik Husein, Sept. 24.

43. LYCÆNA LINGEUS (Cram.).

1 ex. Sheik Husein.

44. LYCÆNA MORIQUA (Wallengr.).

1 ex. Argeisa, July 18.
1 ex. Sheik Husein, Sept. 29.

45. LYCÆNA BÆTICA (L.).

1 ex. Sheik Husein, Sept. 28.

46. Lycæna gaika (Trim.).

2 ex. Sheik Husein, Sept. 26, 29.

47. Lycænesthes larydas (Cram.).

2 ex. Sheik Husein, Sept. 20.

Family Pieridæ.

48. Terias zoe (Hopff.).

1 ex. ♀. Argeisa, July 18.
10 ex. ♂ ♀. Sheik Husein, Sept. 19–28.

49. Terias regularis (Butl.).

1 ex. ♂. Dabulli, Sept. 16.
2 ex. ♂ ♀. Sheik Husein, Sept. 28.

50. Terias bisinuata (Butler).

1 ex. Smith River, Sept. 16.
2 ex. Sheik Husein, Sept. 20 to Oct. 1.

51. Mylothris agathina (Cram.).

3 ex. Sheik Husein, Sept. 24 to Oct. 2.
1 ex. ♂. Meo, Oct. 25.

52. Pieris gidica (Godt.).

5 ex. ♂ ♀. Sheik Husein, Sept. 20–25.

The males are typical *P. gidica*, but the female would be considered by most entomologists to be *P. abyssinica*, Lucas. My impression is that these two species are identical.

53. Pieris severina (Cram.).

1 ex. Argeisa, July 18.
1 ex. Smith River, Sept. 16.
4 ex. Sheik Husein, Sept. 23 to Oct. 2.

54. Pieris lordaca (Walker).

1 ex. ♂. Sibbe, July 7.
2 ex. ♂. The Haud, July 25.
1 ex. ♀. Dachetu, Aug. 9.
1 ex. ♀. Dabulli, Sept. 16.

55. Pieris thyso (Hopff.).

2 ex. Meo, Oct. 10, 25.

56. Herpænia melanarge, Butler.

1 ex. The Haud, July 22.
1 ex. Sassabane, July 31.
1 ex. Sibbe, Aug. 4.
1 ex. Fussa, Sept. 12.

57. TERACOLUS AURIGINEUS, Butler.

4 ex. Sheik Husein, Sept. 20–28.

58. TERACOLUS CHRYSONOME (Klug).

1 ex. Ahdeh, July 14.
3 ex. Sheik Husein, Sept. 24, 28.

59. TERACOLUS CATOCHRYSOPS, Butler.

2 ex. ♂ ♀. Darro Mts., Nov. 19.

60. TERACOLUS CALAIS (Cram.).

2 ex. Ahdeh, July 14.
1 ex. Stony-brook, Ehrer River, Aug. 19.
1 ex. ♀. Sheik Husein, Sept. 25.

61. TERACOLUS OCELLATUS, Butler.

1 ex. Shebeli, Aug. 30.

62. TERACOLUS PROTOMEDIA (Klug).

1 ex. Silou, Aug. 7.
1 ex. Ehrer River, Aug. 16.
1 ex. Shebeli, Aug. 24.
1 ex. Sheik Husein, Sept. 29.

63. TERACOLUS PHLEGYAS (Butler).

1 ex. Sheik Husein, Sept. 26.

64. TERACOLUS PHŒNIUS (Butler).

2 ex. ♂ ♀. Sheik Husein, Sept. 20, Oct. 2.

65. TERACOLUS MILES, Butler.

1 ex. ♂. Argeisa, July 18.
1 ex. ♂. Darro Mts., Nov. 4.

66. TERACOLUS AGOYE, Wallengr.

2 ex. The Haud, July 25.
3 ex. Silou, Aug. 7.

67. TERACOLUS OMPHALE (Godt.).

1 ex. Sheik Husein, Sept. 27.

68. TERACOLUS JACKSONI, E. M. Sharpe.

4 ex. ♂ ♀. Sheik Husein, Sept. 19 to Oct. 2.

69. TERACOLUS EVENINA (Wallengr.).

1 ex. Ahdeh, July 14.
1 ex. Sheik Husein, Oct. 1.

70. TERACOLUS ANTEVIPPE (Boisd.).

1 ex. Sheik Husein, Sept. 19.

71. Teracolus subvenosus, Butler.

1 ex. Sheik Husein, Sept. 20.

72. Teracolus sipylus, Swinh.

5 ex. Sheik Husein, Sept. 23 to Oct. 2.

73. Teracolus minans, Butler.

2 ex. Sheik Husein, Sept. 19–26.

74. Teracolus phillipsi, Butler.

1 ex. ♂. Ahdeh, July 17.
4 ex. ♂ ♀. Sheik Husein, Sept. 19 to Oct. 1.

75. Teracolus citreus, Butler.

4 ex. ♂ ♀. Argeisa, July 18.
1 ex. ♂. Stony-brook, Aug. 29.
1 ex. ♂. Meo, Oct. 25.

76. Teracolus heliocaustus, Butler.

1 ex. Sibbe, Aug. 4.

77. Teracolus leo, Butler.

1 ex. ♀. Shebeli, Aug. 24.
1 ex. ♂. Sheik Husein, Sept. 28.

78. Colias electra (L.).

1 ex. Sheik Husein, Sept. 23.
3 ex. Darro Mts., Nov. 6–19.

79. Eronia cleodora, Hübn.

1 ex. Dabulli, Sept. 16.
1 ex. Sheik Husein, Sept. 24.

80. Eronia leda, Doubled.

1 ex. Sheik Husein, Sept. 28.
1 ex. Meo, Oct. 25.

81. Catopsilia florella (Fabr.).

1 ex. Argeisa, July 18.
7 ex. Sheik Husein, Sept. 24 to Oct. 2.

82. Synchloe glauconome (Klug).

1 ex. The Haud, July 22.

Family Papilionidæ.

83. Papilio demoleus, L.

1 ex. Stony-brook, Ehrer River, Aug. 19.
3 ex. Sheik Husein, Sept. 12–28.
1 ex. Darro Mts., Nov. 4.

84. Papilio brontes, Godman.

1 ex. Meo, Oct. 25.
1 ex. Darro Mts., Nov. 10.

85. Papilio donaldsoni, sp. n.

Allied to *P. nireus*, but differs in the brilliant blue band on the fore wing.

Fore wing.—The blue band ending below the median nervure much narrower in width and distinctly separated by the black nervules. The two blue spots near the apex clearly defined but smaller. *Hind wing*: similar to *P. nireus*, but the band not so wide and terminating above the anal angle.

Underside.—With the exception of the yellow submarginal band on the hind wing, there is no other difference from *P. nireus*. This band is almost united from the apex to the first median nervule, the outward lines or edges being almost straight.

♀. Similar to the female of *P. nireus* in colour, but the blue band terminates below the discoidal cell, as in the male. Underside entirely brown, without the yellow submarginal border on the hind wing.

Expanse: ♂ 3·2 inches, ♀ 3·6 inches.
3 ex. Darro Mts., Nov. 6.
2 ex. Meo, Oct. 25.

86. Papilio antinorii, Oberthür.

2 ex. Walenso, Oct. 25.
2 ex. Darro Mts., Nov. 4–16.

Family Hesperiidæ.

87. Ismene forestan (Cram.).

1 ex. Sheik Husein, Sept. 26.

88. Hesperia vindex (Cram.).

1 ex. Sheik Husein, Sept. 24.

89. Pamphila inconspicua, Bert.

1 ex. Argeisa, July 18.
1 ex. Shebeli, Aug. 30.
1 ex. Sheik Husein, Sept. 28.

90. Nisoniades djælælæ (Wallengr.).

1 ex. Goura, Sept. 14.
1 ex. Sheik Husein, Sept. 28.

91. Nisoniades westermanni (Latr.).

6 ex. Sheik Husein, Sept. 19–26.

6. On the Anatomy of a Grebe (*Æchmophorus major*), with Remarks upon the Classification of some of the Schizognathous Birds. By Frank E. Beddard, M.A., F.R.S., Prosector to the Society.

[Received March 17, 1896.]

As so few of the Grebes have been dissected, I took the opportunity offered, by the death some months since of a specimen of *Æchmophorus major*, to make some notes upon the principal viscera and muscles, which I now lay before the Society.

As is well known, birds differ very much in the extent of a horizontal membrane which is attached laterally to the oblique septa and posteriorly and ventrally to the abdominal wall. This membrane has been variously termed "Omentum," "Pseudepiploon," and "Horizontal septum." When the abdominal viscera of the Grebe are exposed by cutting carefully through the body-wall at some distance behind the sternum, the cavity which contains them is seen to contain only the intestines. As is the case with many other birds, with many Passeres for instance, the duodenal loop is very extensive, reaching right to the end of the abdominal cavity. This cavity, containing the intestines, is shut off from the anterior part of the abdominal cavity by an almost vertical septum, which is the reduced equivalent of the horizontal septum. This septum cuts off from the intestinal cavity another cavity which incloses the gizzard and the liver, and is again divided into right and left halves by the falciform ligament. The right cavity thus formed contains as usual only the right lobe of the liver. I should mention also, as a fact of some systematic importance, that neither the gizzard nor the entire extent of the liver is sheltered by the sternum; they lie nearly altogether behind it. In this particular *Æchmophorus* differs from *Psophia*, *Cariama*, and the Rallidæ; but the Grebe agrees with those birds as well as with the Ducks in the small extent of the horizontal septum.

§ *Myology*.

I have only made notes upon the more important muscles from a classificatory point of view.

The arrangement of the tendons of the *tensores patagii* is characteristic. The tensor brevis is early divided into two separate tendons which run down the patagium to be inserted as usual on to the forearm. They do not, however, as in the majority of birds, form well-defined narrow tendons, but are thin and ill-defined sheets of tendon. The division which lies nearest to the humerus is particularly thin and difficult to delimit. The outer band has a thickened strand on the side nearest to the humerus; it thins off gradually on the outer side. The nerve to the hand passes under

the inner tendinous band and the thickened inner strand of the outer band, but above the rest of the tendon. The tensor longus tendon, as usual, dilates at the middle of the patagium into a yellowish thickened nodule of different appearance from the rest of the tendon. From this, or from its immediate neighbourhood, arise a few strands of tendinous tissue arranged in a fan-like fashion, which become collected into a thin tendon running obliquely across the patagium to be inserted on to the tendon of the extensor metacarpi. One of the thin strands which make up the patagial fan is directly continuous with the biceps slip. The muscle in fact appears to end in this tendon, and not to be inserted, as is more usually the case, into the tendon of the tensor longus.

The *biceps* is less fleshy than this muscle often is. The tendons of origin and insertion are continued over the greater part of the muscle as superficial tendinous sheets. The muscle has practically only one head of origin, that from the coracoid; there is, however, what I believe to be the remains of the humeral head in the shape of an attachment to the under surface of the pectoralis major.

The *deltoid* has an insertion upon the humerus of no great extent. It is attached to that bone for rather less than a third of its length.

The *anconæus* has a humeral head which is a somewhat narrow tendon arising close to the insertion of the latissimus dorsi.

The *expansor secundariorum* appeared to be totally absent.

The *pectoralis major* is rather a thin muscle; it is, however, for a portion of its extent divisible into two layers. The superior margin of the muscle, *i. e.* that furthest away from the carina sterni, is largely tendinous. The insertion of the muscle on to the crest of the humerus is tendinous throughout for about the last eighth of an inch.

The *pectoralis minor* is, as usual, a bipinnate muscle, but the lower side is much wider than the upper. Its origin from the sternum and the carina extends rather more than halfway down.

The *latissimus dorsi* is as usual divided into two muscles, with a branch going to the skin (not always present in birds). This is the dorso-cutaneous of Fürbringer. The last mentioned overlaps the entire origin of the posterior half of the muscle and is continuous with the origin of the anterior.

The *glutæus maximus* consists of two separate parts. In front of the acetabulum is a not very wide ($\frac{1}{3}$ inch) strap-shaped band about the same size as the sartorius, which it partly overlaps. From the acetabulum to the very end of the ilium arises a sheet of muscle which completely covers the underlying biceps, and is inserted on to the fascia covering the leg from the knee to nearly halfway down.

The *glutæus medius* is incompletely divided into two halves. They run side by side, and are inserted each by a separate tendon of insertion which are connected by a muscular part.

The *glutæus minimus* is completely hidden by the last muscle; it is small and entirely fleshy and arises from the ilium only.

The *biceps* is large and fleshy, about an inch across at its origin. The tendinous sling through which it passes to its insertion is formed of two strong ligaments attached to the femur; one of them is identical with the head of the gastrocnemius. In addition to these two, there is a broad coarsely fibrous band running from the bottom of the loop to one of the flexors of the foot.

The *ambiens*, the *femorocaudal*, and the *accessory semitendinosus* are absent.

The *accessory femorocaudal* is a thin muscle tendinous at both origin and insertion.

The *semitendinosus* and the *semimembranosus* appear to form one intimately conjoined muscle, which gives off before its insertion a very delicate tendinous slip to the gastrocnemius.

Only one *peroneus* is present in *Æchmophorus*. The origin of this overlaps that of the tibialis anticus. The tendon in which it ends is inserted into the mass of fibro-cartilage at the ankle through which the flexor tendons bore their way.

The *tibialis anticus* has a tendon which is bifid at its insertion; just in front of the point at which the tendon divides, a tendinous slip is given off which runs for some way down the foot and is finally fixed to skin.

The *extensor communis digitorum* divides into three tendons for the toes. That supplying digit II. remains a single tendon. The tendon supplying digit III. divides into three separate tendons; while the tendon supplying digit IV. divides into two.

The *gastrocnemius* has the usual three heads. The inner is much the largest, and its origin commences at the very summit of the great cnemial crest of the tibia and extends halfway down the leg. The outer head arises, as has been already mentioned, in common with the tendinous sling of the biceps. These two heads end in tendons at precisely the same level below. Shortly after this (about $\frac{1}{3}$ inch) they join. The third head arises in common with the tendinous insertion of the outer of the two adductors; its tendon (ossified) joins that of the inner head some way in front of the junction of the inner and outer heads.

Flexores perforati.—There are the usual three muscles supplying the three digits. Their tendons are not connected with each other, or with the tendons of the flexor perforatus et perforans, in any way.

Flexor perforatus et perforans.—Only one digit (III.) is supplied by this. The tendons of the flexor profundus digitorum and of the flexor longus hallucis are intimately fused for a considerable length. From the conjoined tendon no slip is given off to the hallux. Each of the other digits has its own slip. The tendon supplying digit II. arises first; then the remaining part of the tendon divides into two, each half supplying digits III. and IV.

§ *Comparison of* Æchmophorus *with other Colymbi.*

My information as to the myology of other Grebes is derived

from the works of Garrod[1], Fürbringer[2], and Gadow[3], and from my own dissection of *Podicipes cristatus*. These observations only refer to various species of *Podicipes* (*P. cornutus*, *P. cristatus*, *P. minor*, *P. novæ hollandiæ*). The differences between these forms and *Æchmophorus* are not great. The tendons of the tensor brevis are, however, a little different, judging from the figure which Fürbringer (*loc. cit.* pl. xix. fig. 4) gives of *Podicipes cornutus*. In that Grebe the tendon of the *brevis* and the recurrent tendon, the *longus*, appear to form a continuous sheet of tendon covering a good deal of the patagium. In *P. cristatus* the biceps slip joins the *brevis* tendon. The biceps is two-headed in some other Grebes, but single in *P. cristatus*. The *expansor secundariorum* is not entirely absent in other Grebes, but is rudimentary. I did not look for it with a microscope in *Æchmophorus*, so there may be a faint rudiment. I could not find one, however, in *P. cristatus*.

The syrinx of *Æchmophorus* (fig. 1) has a very incomplete bronchidesmus, a very wide space between the two bronchi existing above its anterior edge. The last two tracheal rings are fused to form a long box, into the composition of which it appears to me that the first bronchial semiring enters. In any case, if that be not

Fig. 1. Fig. 2.

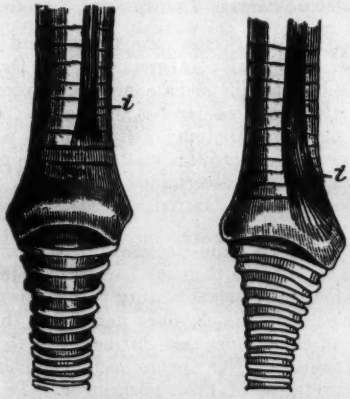


Fig. 1.—Syrinx of *Æchmophorus*: *i*, intrinsic muscles.
Fig. 2.—Syrinx of *Tachybaptes*: *i*, intrinsic muscles.

so, the first bronchial semiring has the unusual relations shown in the drawing, which are perfectly consistent with the belief that the ring is the second bronchial. The intrinsic muscles are attached to the third tracheal ring in front of the tracheo-bronchial box. The

[1] Collected papers *passim*.
[2] 'Untersuchungen zur Morph. u. Syst. der Vögel.'
[3] "Aves" in Bronn's 'Thier-Reich.'

bronchial semirings are fairly ossified, but have rather wide membranous interspaces.

In *Podicipes cristatus* there is the same failure of the intrinsic syringeal muscles to reach even the end of the trachea. A box is formed by fusion at the end of the trachea, into which it appears to me the first bronchial semiring does not enter. The bronchial semirings are deeper and closer together, and the whole bronchus is more ossified, than in the last genus. The bronchi, too, are longer.

In *Podicipes coronatus* the syrinx is much the same, but of course smaller. The first free semiring of the bronchus seems to be No. 2. There is a wider membranous interval between it and the antecedent tracheo-bronchial box than in the last species.

Tachybaptes fluviatilis (fig. 2, p. 541) has a different syrinx. The last three tracheal rings are only fused in front, though they are closely united laterally. These rings are much ossified. The insertion of the intrinsic muscles is remarkable. They run obliquely forward, converging, to be inserted into the last three tracheal rings. The first bronchial semiring is arched, and ossified in front where it is fused with the tracheal box; otherwise it and the succeeding rings are cartilaginous. It is clear, therefore, that the syringeal characters justify the generic distinction here adopted.

§ *On the inter-relationships of Podicipedidæ, Laridæ, and Alcidæ.*

By some, *e.g.* by Mr. Sclater, the Grebes and the Auks are referred to one order. By others, *e. g.* by Dr. Gadow, the Laridæ are placed in the immediate neighbourhood of the Auks, both being separated from the Grebes and Loons. In preparing a general treatise upon the Anatomy of Birds, upon which I am now engaged, I have had to go into this matter. I propose to give now such new facts as I have ascertained for myself, and extracted from the note-books of Mr. Garrod and Mr. Forbes, which bear upon this question.

It appears to me to be quite necessary to separate more widely the Alcidæ from the Laridæ, than the Laridæ from the Charadriidæ (s. l.). Dr. Gadow, in the classificatory part of his account of the Birds in Bronn's 'Thier-Reich,' does not define the Lari by one single character of importance that distinguishes them from all of the remaining Limicolæ. Nor are any such characters forthcoming from the elaborate tables of Prof. Fürbringer. In attempting to justify the separation of some such group as the Longipennes, I have, on the contrary, found additional evidence for a closer union between the Gulls and the Plovers. I should regard the former, in fact, as merely forming a family of Dr. Gadow's Limicolæ, equivalent, for instance, to Chionididæ, Œdicnemidæ, &c. And this family will have to be defined wholly by external characters.

I imagined for some time that the remarkable condition of the *biceps brachii* in the Gulls would prove a fact of classificatory value. In Gulls the *biceps* is divided into two distinct muscles, corresponding to the humeral and coracoidal heads of the more normal

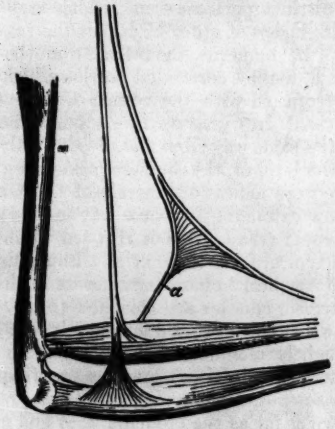
biceps of other birds. The coracoidal part of the muscle again divides into two parts, of which one supplies the radius, and the other the ulna. Dr. Gadow mentions, upon the authority of Meckel, that in *Himantopus* and *Scolopax* the biceps is divided. I find in a specimen of *Himantopus nigricollis* the following arrangement of the several parts of this compound muscle. The muscle has two distinct portions—one, which may perhaps correspond to the entire biceps of other birds, has the two normal heads, one arising from the humerus, the other from the coracoid. In addition to this is a distinct coracoidal portion which has a common origin from the coracoid with the coracoidal half of the double head of the muscle. In *Cursorius* I also found the biceps to be double much in the same way; but the division only commenced a little way below the level of the humeral attachment. Finally, in *Lobivanellus* there were indications merely of the same division by a superficial furrow extending for some way up the muscle.

In the Gulls proper (the *Larinæ* of Howard Saunders) there is a syrinx of a more typical form than in any Limicoline bird known to me. Its more "typical" character consists in the fact that the single pair of intrinsic muscles are attached to the first bronchial semiring, and that that ring is bowed and closely attached to the last of six or seven slightly modified tracheal rings. In the Limicolæ, on the other hand, the intrinsic muscles are frequently absent (*Himantopus*, *Hæmatopus*, *Squatarola*), and when present do not as a rule extend down as far as the bronchi; they end upon a tracheal ring at a variable distance from the end, though in some cases at least they may be continued as far as the bronchi by fibrous tissue. *Lestris*, however, has a syrinx which differs from that of the Gulls in that the intrinsic muscles end at the last tracheal ring, being attached partly to this and partly to the two in front; the muscle, in fact, is inserted rather obliquely. No very distinct line can therefore be drawn between the two groups in the structure of the syrinx.

Some justification for the association of the Laridæ with the Alcidæ is to be found in the disposition of the tendons of the tensor patagii brevis. In the Gulls, as in Limicoline birds generally, the tendon of the brevis muscle is double from the commencement, while the anterior of its two parts gives off just before its attachment a wristward slip from which passes upward obliquely the patagial fan to be inserted on to the tendon of the longus. There is, too, in both groups invariably a biceps slip, which may be inferred from Prof. Fürbringer's statement: as, however, I am acquainted, from my own dissections and from the sketches left by my two predecessors, with a larger series of both Laridæ and Limicolæ than were known to Dr. Fürbringer, the fact seems to be worth emphasizing. In *Larus argentatus* there is, as is shown by a sketch of Mr. Forbes's, a peculiar tendinous slip passing from the tendon of the longus patagii to the flexor side of the forearm, which is quite distinct from the patagial fan already referred to. This has not been observed in any Limicoline birds but *Charadrius pluvialis*; it is highly characteristic of the Alcidæ. It may therefore be useful to

reproduce one or two of the late Mr. Forbes's sketches in illustration of the tensores of those birds, which have been but little described. The simplest form perhaps is to be seen in *Synthliborhamphus antiquus*. Here (fig. 3) there is but one tendon to the

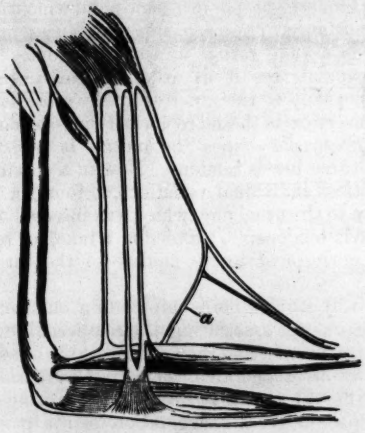
Fig. 3.



Tensores patagii of *Synthliborhamphus antiquus*.
a, slip to ulnar side of forearm.
(From a MS. sketch by the late Mr. Forbes.)

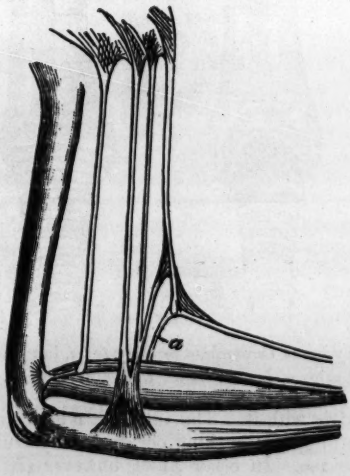
brevis muscle, which is inserted on to the forearm and passes over its muscles to be attached below to the ulna. This single tendon appears to correspond to the anterior of the two invariably present in Gulls and Limicoline birds: this is to be inferred from the fact that it gives off just the merest apology for the wristward branch found in those birds; there is no patagial fan connecting this tendon with the longus tendon; but a thin tendon runs from the longus and is attached to the flexor side of the forearm. Fürbringer's figure of these tendons in *Alca torda* shows no trace of this peculiar slip; but it seems to occur at least in the majority of the Alcidæ. Its presence and the rudimentary character of the wristward branch of the main tendon of the brevis are the special peculiarities of the patagial tendons in the Alcidæ. There are, however, as many as three separate tendons all running parallel in some species. In *Lunda* (see fig. 4), *Ceratorhina* (fig. 5), *Brachyrhamphus*, and *Uria* this is the case. In *Fratercula* and *Alca* there are only two. In a few species (in *Fratercula* for instance) where there is a patagial fan, a small ossicle as in the Petrels is developed. It seems clear, therefore, that the patagial muscles of the Alcidæ do not on the whole favour the close relationship of the Alcidæ to any other Limicoline birds, the resemblance to the Gulls

Fig. 4.



Tensores patagii of *Lunda cirrhata*. *a*, as in fig. 3.
(From a MS. sketch by the late Mr. Forbes.)

Fig. 5.



Tensores patagii of *Ceratorhina monocerata*. *a*, as in fig. 3.
(From a MS. sketch by the late Mr. Forbes.)

and to the Plovers being only seen in one species of each group and in the aberrant *Rhynchops*. There is, moreover, the same amount of likeness to the Limicolæ proper in a small point which may be regarded as of equal importance. The biceps slip, always present in the Alcidæ, has, at least as a rule, rather unusual relations. Thus in *Alca torda* Fürbringer figures it as attached partly to the patagial membrane and partly to the inner of the two brevis tendons. In the Gull the insertion is the more normal one, *i. e.* on to the longus tendon. In *Fratercula arctica* the muscle is inserted upon the middle of the three brevis tendons. Now in a specimen of *Tringa canutus* (doubtless individual variation), I found a second biceps slip in addition to the usual one, which was inserted on to the outer of the two brevis tendons. This tendon I take, for reasons already explained, to correspond to the middle of the three tendons of *Fratercula*.

I have carefully studied the windpipe of a number of Auks, and can find no reasons for associating them especially with the Gulls from an examination of this organ. The syrinx is seen in its most characteristic, even exaggerated, form in *Ceratorhina monocerata*. In this Auk (fig. 6) the first bronchial semiring is the shape of half an ellipse—a gross exaggeration of the generally arched form of this ring in the avian syrinx; the same form is shown by the second bronchial semiring, which lies as it were inside the first

Fig. 6. Fig. 7.

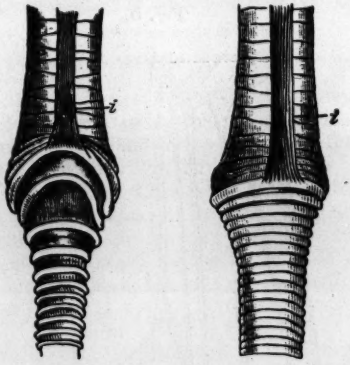


Fig. 6.—Syrinx of *Ceratorhina monocerata*: *i*, intrinsic muscles.
Fig. 7.—Syrinx of *Lomvia troile*: *i*, intrinsic muscles.

and is concentric with it. The intrinsic muscles are attached to the first. Nothing of this kind occurs in any Gull or Limicoline bird known to me. In other Auks, however (fig. 7), the syrinx is decidedly more typical in form. It is an interesting fact that we can arrange the family into two subfamilies according to

the modifications of the syrinx and the muscles of the leg. In *Alca*, *Phaleris*, *Lomvia*, *Uria*, and *Synthliborhamphus* the syrinx does not show the extraordinary modification described in *Ceratorhina* and occurring also in *Lunda* and *Fratercula*. In the three latter genera the ambiens is present, but the accessory femorocaudal is absent. The exactly reversed condition characterizes four of the first mentioned genera[1]. *Uria columbia*, however, has a syrinx which is an approach towards that of the more differentiated types.

May 5, 1896.

Dr. JOHN ANDERSON, F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of April.

The registered additions to the Society's Menagerie during the month of April were 99 in number. Of these, 32 were acquired by presentation, 30 by purchase, 6 were born in the Gardens, 30 were received on deposit and 1 in exchange. The total number of departures during the same period, by death and removals, was 141.

Amongst these attention was called to a young male Indian Elephant (*Elephas indicus*) from Burmah, purchased of Mr. Cross of Liverpool, April 10th[2].

Mr. W. E. Hoyle, M.A., exhibited some photographs of a snake in the act of swallowing a mouse, taken by aid of the Röntgen rays, so that the skeleton tissues of both animals were clearly shown. The snake in question was a common grass-snake (*Tropidonotus natrix*), belonging to Mr. V. H. Sugden, of the Owens College, who kindly superintended that portion of the experiment connected with it. As the snake did not appear hungry, its mouth was opened and the mouse pushed down its throat; when about two-thirds of it had passed between the jaws the first exposure was made, but this failing owing to movement on the part of the snake, ether was administered and complete repose thus secured.

Three exposures were subsequently made—one from above and one from the side,—in which the expansion of the jaws to take in the comparatively large prey was well shown. The third exposure was made when the mouse was completely within the snake's throat, and the contrast between the natural and the distended diameter of the body was very marked. By the kindness of Prof. Schuster, F.R.S., the experiments were made in the Physical Laboratory of the Owens College, and the electric apparatus was superintended by Mr. A. T. Stanton.

[1] *Phaleris* is exceptional in having neither ambiens nor accessory femorocaudal.

[2] This Elephant, on the 4th of June, was found to weigh 11 cwt. 1 qr. 7 lbs.

The following papers were read:—

1. On some little-known Batrachians from the Caucasus. By G. A. Boulenger, F.R.S.

[Received May 4, 1896.]

(Plates XXI. & XXII.)

Ten species of Batrachians have been recorded from the Caucasus, viz. *Rana esculenta*, L. (var. *ridibunda*, Pall.), *R. macrocnemis*, Blgr., *R. camerani*, Blgr., *Bufo viridis*, Laur., *B. vulgaris*, Laur., *Hyla arborea*, L., *Salamandra caucasica*, Waga, *Molge cristata*, Laur. (var. *karelinii*, Strauch), *M. vulgaris*, L. (var. *meridionalis*, Blgr.), and *M. vittata*, Gray. To these 10 species an important addition has recently been made: *Pelodytes caucasicus*, Blgr., the second species of a genus believed to be confined to Western Europe.

Considerable material having reached the British Museum of late, chiefly through the kindness of Dr. G. Radde, Director of the Tiflis Museum, I am able to give detailed descriptions and figures of, or notes upon, five species which are still imperfectly known, viz. *Rana macrocnemis*, *R. camerani*, *Pelodytes caucasicus*, *Salamandra caucasica*, and *Molge vittata*.

Rana macrocnemis.

Rana macrocnemis, Bouleng. Proc. Zool. Soc. 1885, p. 22, pl. iii., and Bull. Soc. Zool. France, 1886, p. 596; Boettg. Ber. Senck. Ges. 1892, p. 136.

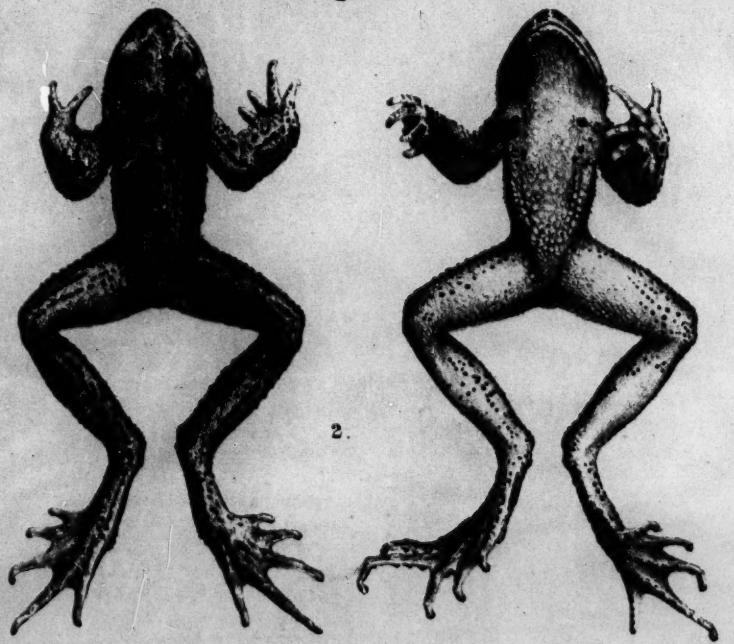
This species was originally described from a single male specimen collected at Brusa, Asia Minor, by the late Baron von Maltzan. It has since been recorded from near Tiflis. The following description is taken from three Tiflis specimens in the British Museum, viz. two from the Tortoise Lake, received from the Senckenberg Museum; the third from Rijut, 4200–4300 feet, presented by Hr. W. Wolterstorff, of Halle. As observed by Prof. Boettger, the snout is often more elongate than in the type from Brusa, approaching in shape that of *Rana agilis*, and the inner metatarsal tubercle a little shorter; otherwise the agreement is complete.

The vomerine teeth form two small oblique groups, close together, entirely behind the level of the choanæ. Head a little broader than long; snout rounded or obtusely acuminate, not prominent, with the lores rather oblique; nostrils nearly equally distant from the eyes and the end of the snout, the distance between them much greater than the interorbital width, which is also much less than the width of the upper eyelid; tympanum one half to three fifths the diameter of the eye, from which it is rather remote. Fore limb very strong in the breeding male, just as in *R. temporaria*, and with the inner finger provided with a still stronger pad, which is not divided by a transverse groove. The first finger extends slightly, but distinctly beyond the second.

1a.

2a.

1.



2.

H.Grönvold del.et lith.

Mintern Bros. imp.

1.RANA CAMERANI. 2.PELODYTES CAUCASICUS

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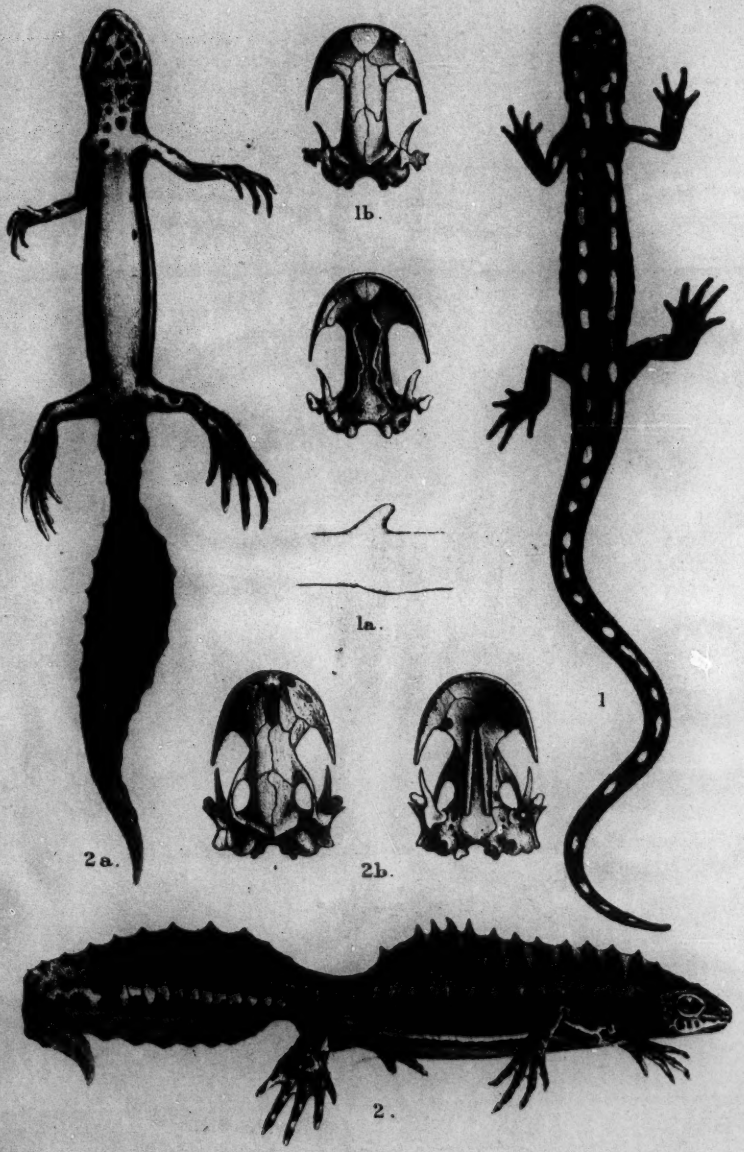

H.Grönvold del. et lith. Mintern Bros. imp.

1. SALAMANDRA CAUCASICA. 2. MOLGE VITTATA

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The tibio-tarsal articulation reaches the end of the snout or beyond, and the length of the hind limb between the vent and the tibio-tarsal articulation exceeds the length of head and body; the tibia is a trifle shorter than the fore limb, and nearly equals the length of the foot. The web between the toes, during the breeding-season, is developed to the same extent as in *R. temporaria*: in the male it reaches to the base of the penultimate phalanx on the inner side of all the toes but the last, which is webbed to the very tip; whilst in the female the last two phalanges of the fourth toe are free on both sides, and the distal phalanx is free on the outer side on the three inner toes and on the inner side on the outer toe. The free border of the web is deeply notched in the female, nearly rectilinear in the male. In the male *post nuptias* the palmation is as in the female. The subarticular tubercles are feebly or moderately developed; the inner metatarsal tubercle is small, oval, soft, rather more developed than in *R. temporaria* and somewhat less than in *R. agilis*; its length is not quite half that of the inner toe; a small tubercle is present at the base of the fourth toe. As in *R. temporaria*, the skin of the back in the breeding male is swollen through the great development of the lymph-cells, whilst in the female pearl-like granules are scattered on the sides, on the pelvic region, and on the hind limbs. The glandular lateral folds are feebly prominent; the distance between them, on the scapular region, equals one fifth to one sixth the length from snout to vent.

The specimens, which have been for some time in spirit, are pale brown above, with large dark spots on the back and sides, and regular cross-bars on the hind limbs; a dark canthal streak, a large temporal blotch and a dark streak along the upper lip; a more or less distinct light streak between the latter and the canthal streak. Lower parts white, with small dark spots on the throat.

As noticed before, the male is provided with a pair of internal vocal sacs.

	♂. millim.	♂. millim.	♀. millim.
From snout to vent	70	67	64
Length of head	20	20	18
Width of head	22	22	20
Diameter of eye	6·5	7	6
Interorbital width	3·5	3·5	3·5
From eye to nostril	5	4·5	4
„ „ end of snout ..	9	9	8
Tympanum	3·5	4	3
From eye to tympanum	2·5	2	2·5
Fore limb	45	42	37
Hind limb	129	120	108
Tibia	42	38	35
Foot	41	39	35
Inner toe	8·5	8	7·5
Inner metatarsal tubercle ..	3·5	3·5	3

RANA CAMERANI. (Plate XXI. fig. 1.)

Rana camerani, Bouleng. Bull. Soc. Zool. France, 1886, p. 597; Boettg. Ber. Senck. Ges. 1892, p. 134.

First described from four specimens collected by Dr. Oscar Schneider on Lake Tabizhuri, 8000 feet, and at Achalkalki, and preserved in the Berlin Museum, this species has been rediscovered in the Karabagh Mountains, around Lake Gokcha, and near Tiflis, where it occurs together with *R. macrocnemis*. Thanks to the kindness of Professor Boettger, the British Museum has received three specimens—one male from Gilli, L. Gokcha, and two young from the C. Karabagh—in exchange from the Senckenberg Museum. Their detailed measurements are recorded below.

R. camerani is very closely allied to *R. macrocnemis*, and more material is required before they can positively be pronounced to be distinct species. The affinity to *R. arvalis* is also very great, but the small size of the inner metatarsal tubercle in *R. camerani* is sufficient for distinction.

The vomerine teeth do not differ from those of *R. macrocnemis*. The snout is more pointed and more prominent, as in a typical *R. arvalis*; the interorbital space is very narrow, one half to two thirds the width of the upper eyelid, and considerably narrower than the distance between the nostrils; the tympanum measures hardly half the diameter of the eye, from which it is separated by a distance equal to at least two thirds its diameter. The first and second fingers are equal, or the first extends very slightly beyond the second; the subarticular tubercles are strong, and the inner metatarsal tubercle is oval, measuring two fifths to one half its distance from the end of the inner toe; the web between the toes is as much developed as in *R. macrocnemis*; the male in breeding attire is, however, still unknown. The tibio-tarsal articulation reaches the eye or the nostril; the length of the hind limb between the vent and the tibio-tarsal articulation equals the length of head and body minus the whole or half the length of the snout; the tibia is as long as the foot or the fore limb. The glandular lateral folds are strong and very prominent; the distance between them, on the scapular region, equals two ninths to one fifth the length from snout to vent.

The coloration is in every respect that of *R. arvalis*, and handsomely striped specimens are also of frequent occurrence; the light moustache is strongly marked, extending from the tip of the snout to the shoulder.

	♂. millim.	Yg. millim.	Yg. millim.
From snout to vent	45	34	32
Length of head.....	15	11	10·5
Width of head	16	11·5	11
Diameter of eye	5	3·5	3·5
Interorbital width.....	2·5	2	2
From eye to nostril	3	2	2

	♂. millim.	Yg. millim.	Yg. millim.
From eye to end of snout	6·5	5	4·5
Tympanum	2·5	2	1·5
From eye to tympanum .	2	1·5	1·5
Fore limb	12	16·5	15·5
Hind limb	74	52	49
Tibia	24	16	15·5
Foot	24	16·5	16
Inner toe	5	3	3
Inner metatarsal tubercle	2	1·5	1·5

PELODYTES CAUCASICUS. (Plate XXI. fig. 2.)

Pelodytes caucasicus, Bouleng. Ann. & Mag. N. H. (6) xvii. May 1st, 1896, p. 406.

Vomerine teeth in two slightly oblique transverse groups between the choanæ. Head slightly broader than long; snout subacuminate, as long as the diameter of the orbit, with moderately distinct canthus; tympanum feebly distinct, two thirds the diameter of the eye. First finger as long as second; toes webbed at the base and fringed; subarticular tubercles strong; a very small inner metatarsal tubercle. The tibio-tarsal articulation reaches the tip of the snout. Body covered with strong warts, some of which are confluent into longitudinal folds; a parotoid-like fold above the tympanum. Olive above, white beneath, all the warts covered with a black horny layer in the male. Male with an internal vocal sac; the fore limbs very strong, with rugose black plates as in *P. punctatus*; similarly with black rugosities round the lower jaw, on the breast, belly, and under the limbs, especially on the subarticular tubercles.

	millim.		millim.
From snout to vent ..	47	From eye to end of snout	7
Head	15	Tympanum	3
Width of head	16	Fore limb	25
Diameter of eye	4·5	Hind limb.....	81
Interorbital width	4·5	Tibia	26
From eye to nostril ..	4	Foot	56

This species, described from a single male specimen from Mt. Lomis, 7000 ft., received from Dr. Radde, is very closely related to the *Pelodytes punctatus* of Western Europe, agreeing in the extraordinary development and distribution of the nuptial horny excrescences on the ventral surfaces in the males, to which attention was drawn by me in 1881 (Bull. Soc. Zool. France, 1881, p. 73, fig.). Here, however, the excrescences extend also to the warts and ridges of the upper surfaces, so that *P. punctatus* must be regarded as the Batrachian in which these temporary attributes of the males reach their highest development.

P. caucasicus is distinguished from its congener in the longer hind limbs and the slightly different disposition of the vomerine

teeth. The toes are not so strongly fringed in the male, and the fore limbs are more robust.

The skeleton of *Pelodytes punctatus* is very peculiar. It was desirable to ascertain whether the new species conforms in this respect to the systematic position assigned to it. Yet it would have been a pity to damage in any way an unique specimen.

Skeleton of *Pelodytes caucasicus*, from a sciagraph, upper and lower view.

Thanks to the Röntgen rays, the difficulty was overcome, and I have much pleasure in introducing what I believe to be the first practical application to herpetology of this startling discovery. I wish to thank Mr. J. William Gifford, who, through the mediation of my friend Prof. Stewart, kindly undertook to photograph the specimen, and to whom I am indebted for the sciagraph from which these figures are drawn.

It will be seen that the new Frog agrees with its Western congener in the large frontoparietal fontanelle; the absence of palatine bones; the very strongly dilated transverse processes of the sacral vertebra and the forward direction of the three anterior to them; the curved coracoids and precoracoids; the bony style to the sternum; the fusion of the two outer bones of the second row in the carpus; and especially in the fusion of the astragalus and calcaneum to a single bone, resembling the fused radius and ulna or tibia and fibula of tailless Batrachians.

[Since the reading of my paper, I have received, July 24th, through the courtesy of the author, M. Nikolski, a copy of the description of a new Pelobatoid, named *Pelodytopsis caucasica*. The genus and species are established on two female specimens from Lagodekhi, Transcaucasia, obtained by M. Mlokossewicz, apparently the same collector who first discovered *Salamandra caucasica*. This Frog is no doubt the same as my *Pelodytes caucasicus*, which has priority, M. Nikolski's paper being signed June 1896. There is no foundation for the new genus, the species being, as I have stated above, very closely related to *Pelodytes punctatus*.]

SALAMANDRA CAUCASICA. (Plate XXII. fig. 1.)

Exaeretus caucasicus, Waga, Rev. et Mag. Zool. 1876, p. 326, pl. xvi.

Salamandra caucasica, Bouleng. Cat. Batr. Caud. p. 5 (1882); Boettg. Ber. Senck. Ges. 1892, p. 132.

Thanks to Dr. Radde, the British Museum now possesses a good series of specimens of this rare Salamander, from Mount Lomis, 7000 feet, from which the following description is drawn up.

The series of palatine teeth extend forwards far beyond the choanæ; they converge and are narrowly separated from each other in front, after being angularly bent and enclosing a rhomboidal space; in the middle the series are closely approximate and parallel; behind they strongly diverge again; in some specimens the angular bend does not exist and each series may be described as S-shaped.

The tongue is large, covering nearly the whole floor of the mouth, free at the sides only.

The head is much depressed, and the eyes moderately large and prominent; the snout is semicircular in outline and does not project beyond the lower jaw. The parotoid glands are flat, not sharply limited as in the other species of the genus. A strong gular fold is present.

The body is much elongate and feebly depressed, with 12 strong costal grooves between axilla and groin; the skin is quite smooth and shiny, without any warts.

The limbs meet or slightly overlap when pressed against the body. The digits are moderately elongate and depressed; the first toe is the shortest, the fourth the longest, slightly longer than the third, the fourth and fifth are equal. The tail is subcylindrical, slightly compressed, and longer than head and body.

Male specimens (8 in number) have a large compressed dermal tubercle, pointed and directed forwards, on the base of the tail, just above the posterior border of the cloaca. This tubercle, I suggest, may assist in clinging to the female during the pairing.

Shining black above, with two more or less regular series of round, oval, or elliptical greenish-yellow spots; blackish brown or dark plumbeous grey beneath, with or without small greyish-white spots or dots; these small spots constantly present on the throat.

	millim.	millim.	millim.
Total length.....	182	155	142
From snout to cloaca ..	66	63	62
Head	13	13	12
Width of head.....	9·5	9·5	9
Fore limb.....	20	21	19
Hind limb	22	23	22
Tail	116	92	80

The lungs are short, as much developed as in *S. maculosa*.

The skull is quite typical of a *Salamandra*, only not so broad as in *S. maculosa* and *S. atra*. There are 17 præcaudal and 53 caudal vertebræ, against 16 and 25 or 26 in *S. maculosa*.

MOLGE VITTATA, Gray. (Plate XXII. fig. 2.)

This handsome Newt is now represented in the Museum by a fine series, consisting of 14 specimens from Brusa, Trebizonde, and Borshom in Transcaucasia. The dorsal crest of the males may be deeply toothed, as in *M. cristata*, which this Newt resembles in the shape of the head, the notch in the crest on the lumbar region, and the long, slender digits. A dermal fold runs along the outer edge of the crus and tarsus in the males. In the Transcaucasian specimens the vertical black bars on the dorsal crest are of equal breadth; a whitish band extends along the middle of the muscular portion of the basal third of the tail, becoming wavy and broken up further down.

The following measurements are taken from five specimens from Borshom:—

	♂. millim.	♂. millim.	♂. millim.	♂. millim.	♀. millim.
Total length	125	120	119	119	113
From snout to cloaca	60	59	60	59	59
Head	14	14	14	14	13
Width of head.....	10	10·5	11	10·5	10
Fore limb.....	25	26	25	26	22
Hand	12	12	11·5	12	9
Hind limb	28	27	27	28	21
Foot	14	14	14	14·5	10
Tail	65	61	59	60	54

An outline figure of the skull has been given by Alfred Dugès in his paper on the Urodeles of France, in 1852. Otherwise nothing is known of the osteology of this species. I have there-

fore had the skeleton of a male specimen prepared, and noted the following points:—

The skull is devoid of ridges, such as are present on the snout in *M. vulgaris* and *palmata*, and the ethmoidal fontanelle is large; the fronto-squamosal arch is bony and slender; the pterygoids considerably fail to reach the maxillaries.

The ilium is suspended from the fifteenth vertebra, as in *M. vulgaris* and *palmata*, and the caudal vertebræ number 32.

EXPLANATION OF THE PLATES.

Plate XXI.

Fig. 1. *Rana camerani* (p. 550). Upper view.
1*a*. „ „ Side view of head.
2. *Pelodytes caucasicus* (p. 551). Upper and lower view.
2*a*. „ „ Open mouth.

Plate XXII.

Fig. 1. *Salamandra caucasica* (p. 553). Upper view.
1*a*. „ „ Skull, upper and lower view, ×2.
1*b*. „ „ Side view of base of tail of ♂, ×2.
2. *Molge vittata* (p. 554). Side view.
2*a*. „ „ Skull, upper and lower view, ×2.

2. Contributions to the Anatomy of Picarian Birds.—Part II.[1] A Note upon the Pterylosis of the Barbets and Toucans. By Frank E. Beddard, M.A., F.R.S., Prosector to the Society.

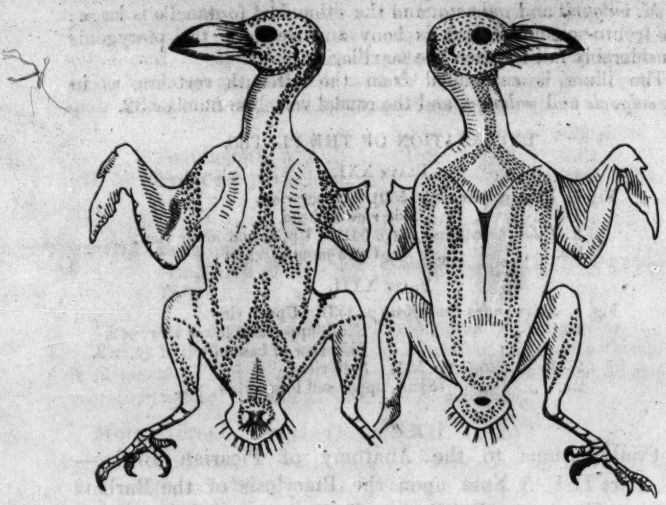
[Received May 4, 1896.]

In a short article mainly referring to the peculiar "intestiniform" gall-bladder of the Toucans and Barbets, the late Mr. Forbes took occasion to point out other resemblances between these families of birds[2] to each other and to the Woodpeckers. With regard to the pterylosis, however, Mr. Forbes contented himself with remarking that "Nitzsch, from pterylographical grounds.... long ago pointed out this connection." Nitzsch undoubtedly placed in one group *Picinæ*, the Barbets, Toucans, and Woodpeckers; but he included with the former in almost inextricable confusion the Bucconidæ, and furthermore observed that "this group also has no general pterylographic character, at least none belonging to itself alone." His plate fully bears out this statement to my mind. Nevertheless it seems to me that there are pterylographic likenesses between the Barbets and the Toucans: I find, in fact, that the pterylosis of such Barbets as I have had the opportunity of examining do not agree altogether with Nitzsch's figures. The species that I have studied are *Megalæma asiatica*, *M. hodgsoni*, *M. javensis*, *Cyanops franklini*, and *Xantholæma rosea*.

[1] See P. Z. S. 1889, p. 587, for Part I.

[2] "Note on the Gall-bladder &c. of the Toucans and Barbets," P. Z. S. 1882, p. 94.

Of these species the last only (under the name of *Bucconides rosicollis*) is figured by Nitzsch, and, as I believe, inaccurately.



Feather-tracts of *Megalæma asiatica*.

The right-hand figure shows the ventral aspect, the left-hand figure the dorsal.

The accompanying drawings illustrate the pterylosis of *Megalæma asiatica*. The drawings are copied from the late Prof. Garrod's MS. As will be seen on comparing them with Nitzsch's figures of *Megalæma armillaris*, there are considerable differences, which of course may possibly exist between allied species. My own observations upon the first four species of my list and those of Mr. Forbes (in MS.) upon *Megalæma virens* agree so entirely with each other and with Garrod's sketch that I cannot but think that Nitzsch has fallen into error.

The chief difference between us—it will be observed—concerns the spinal tract. In all the species of *Megalæma* and *Cyanops* to which I have referred the posterior part of that tract is, as Nitzsch has correctly indicated, not in connection with the anterior fork; but instead of being a straight band ending at the base of the oil-gland, it forks some little way in front of that gland and surrounds it. Another peculiarity of *Megalæma* (not figured by Nitzsch in *M. armillaris*) is a lateral band on either side which commences at the fork of the anterior part of the dorsal tract and runs down to a point about on a level with the middle of the posterior fork. This is quite distinct from the more conspicuous femoral tract, excepting in *M. asiatica*, where the lateral tract joins the femoral posteriorly. This lateral tract is figured by

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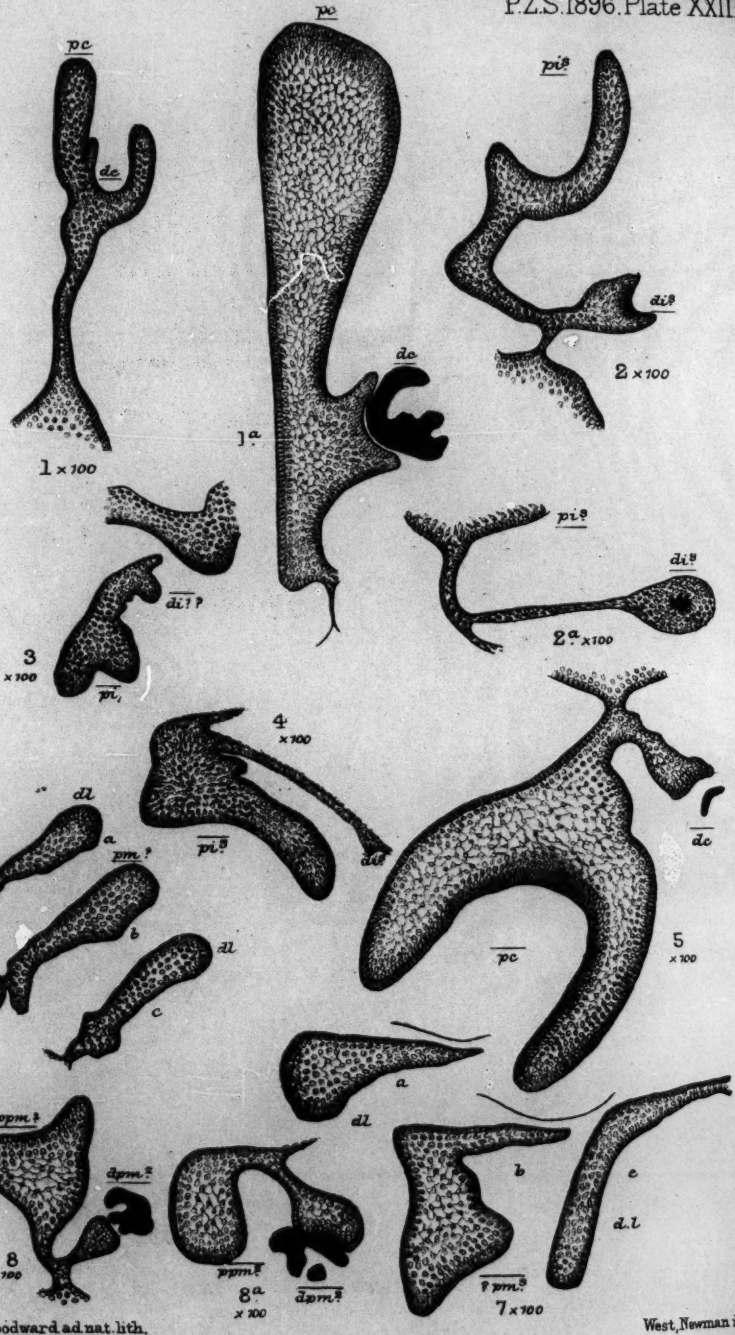

G.M. Woodward ad nat. lith.

West, Newman imp.

Development of the teeth in the Insectivora

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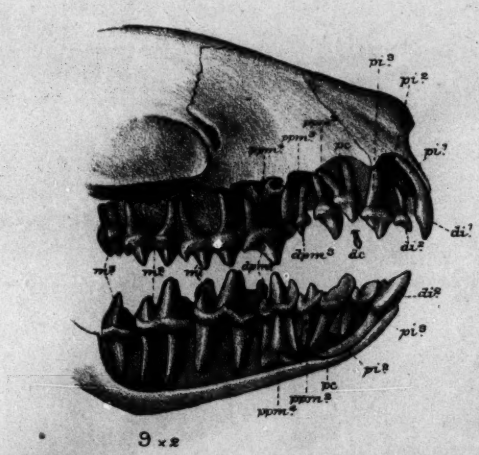

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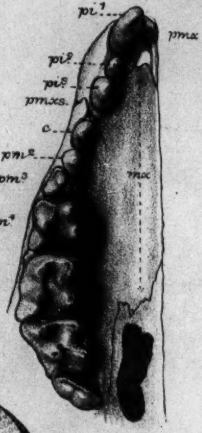
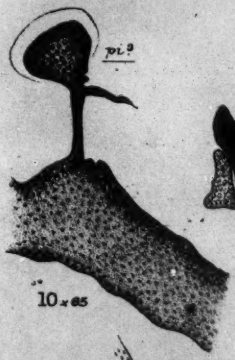
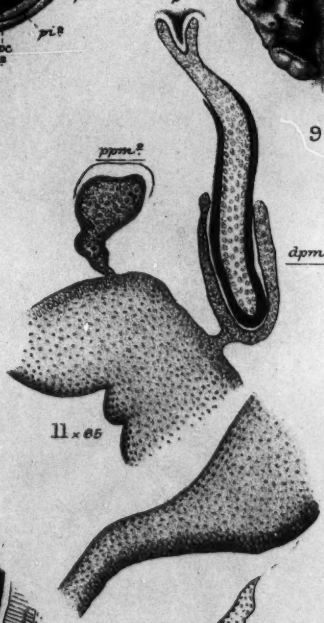


9a x 2



10 x 65



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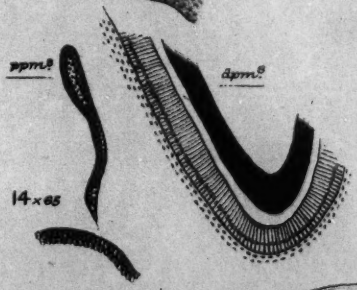
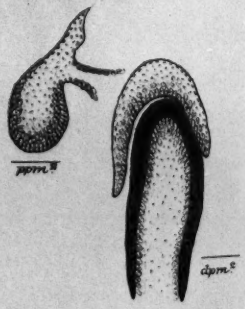
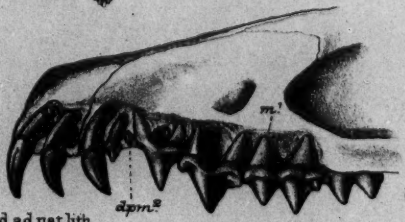


14 x 65



12 x 65



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G.M.Woodward ad.nat.lith.

West, Newman imp.

Development of the teeth in the Insectivora.

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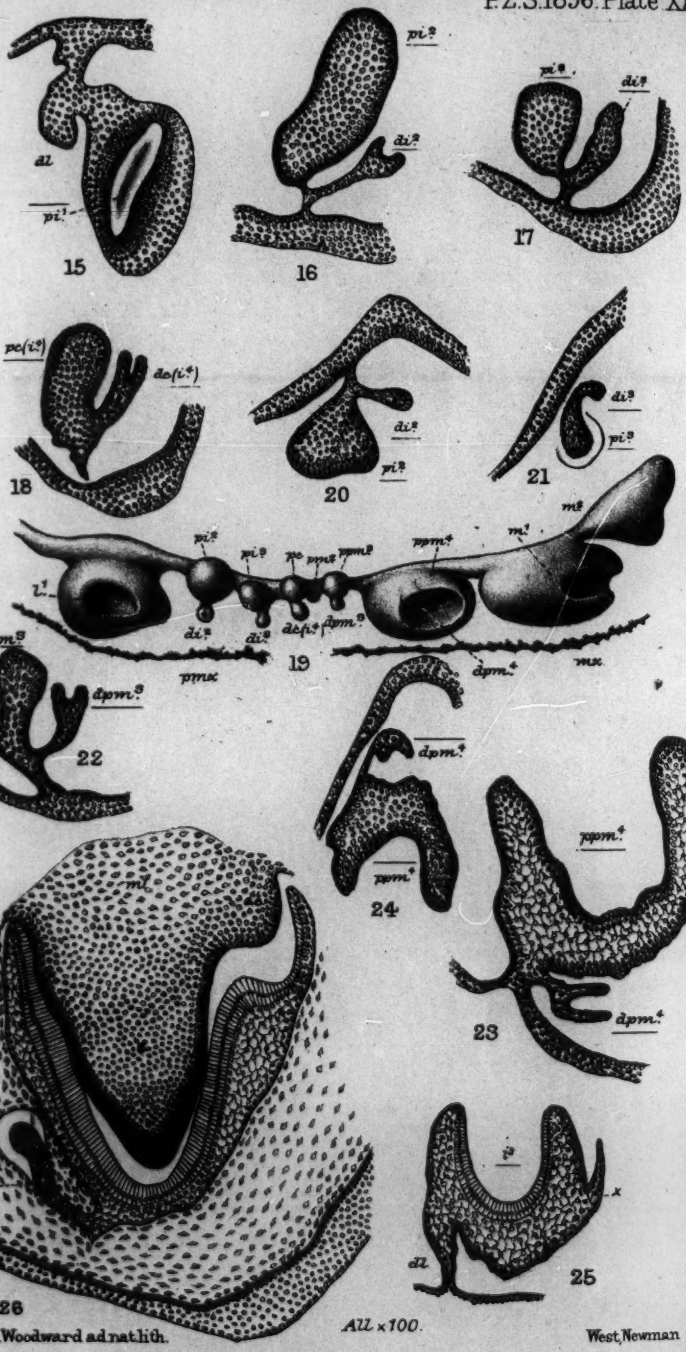

All x 100.

G.M.Woodward ad nat lith.

West, Newman imp.

Development of the teeth in the Insectivora.

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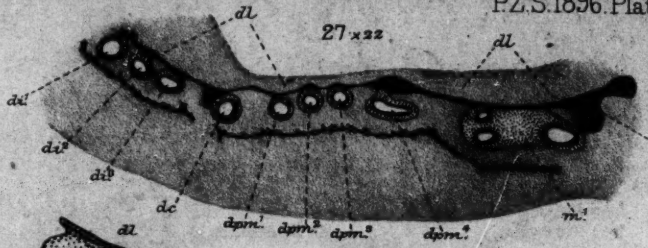

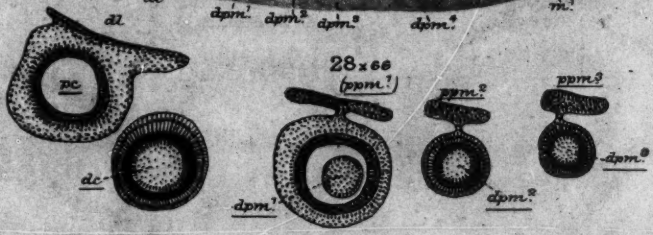

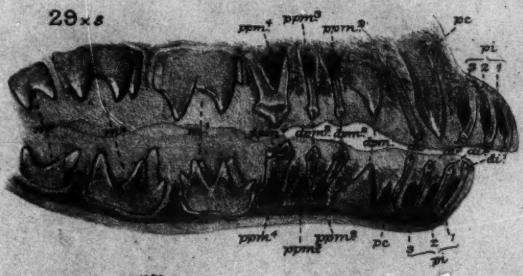

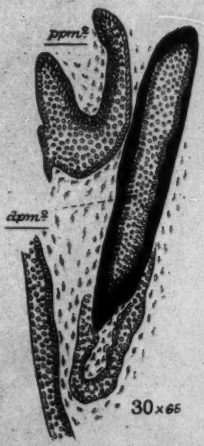

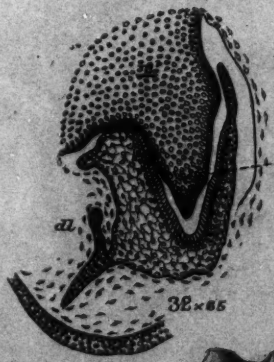

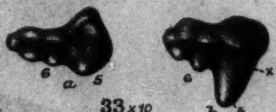

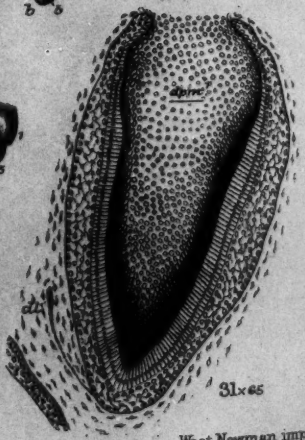

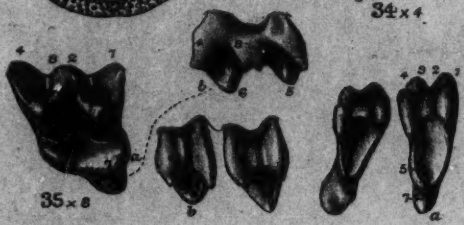

G.M.Woodward ad nat. lith

West, Newman imp.

Development of the teeth in the Insectivora.

Nitzsch in *Trachyphonus* and *Picus* and it also exists in *Iynx* and *Rhamphastos*.

A further likeness between the three families of birds concerned is in the surrounding of the oil-gland by the spinal tract. This occurs, as will be seen from Nitzsch's figures, in both *Picus* and *Rhamphastos*.

If Nitzsch's figures of *Capito* (*Micropogon*) *cayennensis* are correct, we may have in the pterylosis a means of differentiating the Old World from the New World Barbets. For in the latter the posterior part of the spinal tract is separated from the anterior and is composed of two distinct limbs which only join just at the oil-gland. I would further point out that the identity in the pterylosis of *Megalæma* and *Cyanops* is against their generic separation. On the other hand, the pterylosis of *Xantholæma rosea* is very different from that of *Megalæma*, which justifies its retention as a genus.

There is the usual interscapular fork, but there is no break, a rhomboidal apterion being enclosed, as is so far correctly shown in Nitzsch's figure; but although the two halves of the spinal tract do join, the junction is produced only by their lying close side by side and they immediately diverge to end at the sides of the oil-gland. The tract, in fact, has an hourglass-like shape, which is merely an exaggeration of that which, according to Nitzsch's figure, characterizes the Toucans.

In the lateral and femoral tracts *Xantholæma* agrees with *Megalæma*. I find, after examining *Selenidera maculirostris* and *Aulacorhamphus prasinus*, that all the Toucans do not agree with Nitzsch's figures of *Rhamphastos erythrorhynchus*. In the two just-mentioned birds there is no break in the spinal tracts, which are thus more like those of *Xantholæma*. The femoral tracts do not arise from the spinal tracts so high up as is figured by Nitzsch, and the lateral tract, apparently absent altogether from *Aulacorhamphus*, is very rudimentary in *Selenidera*, consisting of only three or four feathers.

3. Contributions to the Study of Mammalian Dentition.—Part II.[1] On the Teeth of certain Insectivora. By M. F. Woodward, Demonstrator of Zoology, Royal College of Science, London.

[Received May 5, 1896.]

(Plates XXIII.–XXVI.)

In their general organization the Insectivora are undoubtedly very primitive, consequently one might reasonably expect to find their dentition in a similar lowly state. This at first sight appears to be the case, at least so far as the pattern of the molar teeth is concerned, for if we accept the tritubercular form as the primitive

[1] For Part I., see P. Z. S. 1893, p. 450.

one for those teeth, then we find this type apparently preserved in all its purity in certain living Insectivores (*Centetes*, *Ericulus*, and others), a condition almost unique amongst living mammals; in addition, some Insectivores exhibit molar teeth which are supposed to be but slightly in advance of this, having acquired a small heel above and below, thus presenting to us the trituberculo-sectorial type (well seen in the upper molars of *Tupaia*, *Sorex*, &c., and in the lower molars of the *Centetidæ* and *Chrysochloris*).

On the other hand, in many respects the dentition of this order cannot be regarded as primitive, for the ante-molar teeth are obviously specialized both with regard to their form and number. The molars, too, in many genera are clearly modified from a tritubercular standpoint, the upper molars being often quinque-tubercular, while below the heel may attain equal importance with the trigon and develop numerous cusps; in others the paraconid is lost, thus producing a quadritubercular crown, an admittedly specialized type of lower molar.

As a whole the teeth of this order are characterized by the strong development of their cusps, a condition closely associated with their insectivorous diet; this, perhaps, accounts for their resemblance to the teeth of the early Jurassic mammals, it being highly probable that the latter were also insectivorous. If this was the case, then the presence of these supposed primitive tooth-patterns among living Insectivores may be due rather to the similar nature of the food of these two groups, so widely separated in time, than to an actual persistence of the unmodified tritubercular molar from Mesozoic times until to-day.

Until recently it was generally supposed that the Insectivora were quite normal in their tooth change, Owen (18), Rousseau (21), Dobson (3), and others describing a full milk-dentition in some genera. But at the same time, it was known, from the researches of Spence Bate (1) on the Mole (*Talpa*), that the milk-dentition might be very transitory.

Recently Leche (7 & 9) has published the results of an investigation concerning the relationships of the milk and permanent sets of teeth in a number of genera, adopting the more modern methods of microtomy to aid him in his researches, which were extended to fœtal as well as numerous stages after birth, until the full adult dentition was acquired.

In his first and preliminary communication, Leche (7) came to the most interesting conclusion that in the anterior tooth-region of the adult *Erinaceus* a mixture of milk and successional teeth was to be met with. The adoption of these results unfortunately led me to put forward the view (30) that *Erinaceus*, in respect to the relation of its sets of teeth, was intermediate between the marsupial condition with its persistent milk set and the typical diphyodont placental stage. This now turns out to be quite erroneous, for Leche, in his later and complete work (9), shows conclusively that *Erinaceus* possesses vestiges of two complete dentitions, and that those anterior teeth, which are apparently only

represented in one set, belong to the replacing series, being preceded by tooth-vestiges referable to the milk-dentition. This last conclusion I can now entirely confirm and strengthen, for the specimens which I have investigated exhibit these features much better than Leche's embryos did[1].

Both Leche and myself have investigated *Erinaceus*, *Ericulus*, *Sorex*, and *Talpa*, and he has further studied *Crossopus*, *Scalops*, and *Condylura*, whilst I have independently investigated *Centetes* and *Gymnura*. These are unfortunately representatives of only 5 out of the 9 families of living Insectivora (Flower and Lydekker, 4), thus leaving at least 4 other families, some of which are extremely interesting, still to be investigated.

In addition to studying the relations of the two sets of teeth, I have attempted to trace the origin of the cusps of the molar teeth, noting especially the order of development of those structures in the light of the researches of Osborn, Röse, and Taeker.

Erinaceus europæus.

Of our common English Hedgehog I have examined two specimens intermediate in age between Leche's stages E and F, that is between his oldest fœtus and his new-born young. Further, I have examined a large series of dried skulls, including those in the collection at the British Museum.

The statements concerning the milk-teeth of this genus and allied forms in many, especially the older, text-books are most misleading, and even in more modern works we find the whole group described as diphyodont. This, though strictly true, was not based on any detailed examination of the various genera, but rather hastily concluded from the knowledge that one form was found to exhibit this condition, or else copied from some old and unreliable accounts, as, for instance, that of Rosseau (21), who stated that *Erinaceus* had a deciduous dentition composed as follows, viz.:— i. $\frac{2}{1}$, pm. $\frac{1}{1}$, which were shed at the age of 7 weeks. Dobson (3) also speaks of a full milk-dentition, but it is obvious that he simply described as milk-teeth all those teeth which were visible in the jaw of the young Hedgehog at birth, and that he had never seen any actual replacement. He states, in contra-distinction to Rosseau, that at 6 weeks all the permanent teeth were present.

The erroneous nature of these conclusions has been pointed out by Leche (9); and it may be ascertained by anyone, from the study of a few young skulls, that the only milk-teeth recognizable by the ordinary methods of dissection or examination of dried skulls are i. $\frac{2}{1}$, c. ($\frac{1}{1}$), pm. $\frac{1}{1}$. The remainder being only to be made out, and then with difficulty, by the examination of serial sections of fœtal jaws, a method not adopted by the earlier observers.

[1] It is just possible that our English Hedgehog differs in respect to the amount of development of these milk-tooth vestiges from its continental cousin, although they are considered as one species; on the other hand, my two specimens may represent individual variations.

The discovery by Leche (9) of the extremely variable nature of the upper deciduous canine (Plate XXIV. fig. 9, dc.) forms the key to his conclusions, for this enabled him to perceive that the milk set were in part undergoing reduction, and to formulate the belief that the knob-like labial growth of the dental lamina which he found in connection with $\frac{i.3}{}$ was the last trace of the enamel-organ of the milk predecessor of that tooth: from this he concluded that the milk predecessors to the following teeth $\frac{\text{pm. 1}}{\text{i. 2, c., pm. 1}}$ had been entirely suppressed.

The conclusions may seem very bold, but their correctness is proved beyond a doubt by the two stages which I have been fortunate enough to obtain.

Taking as a starting-point the upper canine, I find that in my younger stage the enamel-organ of the permanent canine (pc.) is in a very backward condition, whereas labially a small tooth is developing (fig. 1, dc.; see also Leche, Taf. iv. figs. 41–50); from the condition of this latter structure it is possible that it might develop into a small functional milk-tooth (fig. 9, dc.), and from its position and general relationship it is obviously the milk-canine. In the older stage we note (fig. 1 *a*, pc.) that the enamel-organ of the permanent canine is more developed, and that attached to the labial side of the neck of this structure, *i. e.* the dental lamina, is a slight outgrowth, indenting which is a small irregular calcification (dc.); this is in the position of the germ of the deciduous canine of the younger stage, and evidently represents that tooth in a more advanced condition, *i. e.* as regards calcification, but at the same time retrograded, for it is so small and irregular that it could not become a functional tooth and probably would not even cut the gum. Thus we see that the canine may vary from a functional tooth (Leche) to a minute irregular calcification of no physiological importance (*cf.* figs. 9 & 1 *a*, dc.).

Considerable doubt has been expressed at one time or another concerning the exact homology of the first upper maxillary tooth of *Erinaceus*, its form in the permanent series being so unlike that of a typical canine, for the reason that it possesses indications of two fangs; moreover, it is apparently situated a considerable distance behind the premaxillo-maxillary suture. If, however, a young skull be examined (fig. 9), we find that the deciduous canine, when present as a conspicuous tooth, bears but a single fang and is situated close to the suture, as also is the developing permanent canine, the apparent change in position of the latter tooth being due to the forward extension of the maxilla, growing so as to embrace the premaxilla both labially and on its palatal border (fig. 9 *a*); thus the external premaxillo-maxillary suture in the adult is apparently situated far in front of the canine tooth. The true position of this tooth can be ascertained even in an adult skull if the palatal aspect of the latter be examined, then the canine is seen to be situated almost within the true suture and certainly not far behind it.

The Upper Incisors.

I. 1 & i. 2 are present as functional teeth both in the milk and replacing dentition, but the latter (pi. 1 & pi. 2) develop late, and in my sections are only indicated by well-marked lingual growths of the dental lamina. Pi. 2 is the most variable in the different species, and in the younger stage examined no signs of it are yet visible. I. 3 as a functional tooth is known only in the adult dentition. Leche refers this to the replacing series, because he finds a bud-shaped labial outgrowth of the dental lamina related to the enamel-organ of this tooth. In both my specimens I find a calcified structure connected with this labial growth (fig. 2, di. 3); this in the younger stage is a distinctly cup-shaped dentinal body, while in the older specimen (fig. 2 *a*) the condition is more like that figured by Leche (Taf. vii. fig. 52, Jd. 3), save there is a small calcification indenting his Jd. 3 from behind. A comparison of this labial calcification (di. 3) with the reduced dc. (fig. 1 *a*) shows that these two structures evidently belong to the same order, *i. e.* are reduced teeth of the milk series, the incisior being more vestigial.

This confirms Leche's view that the adult i. 3 belongs to the replacing series, and is the true pi. 3.

The Lower Incisors.

The first enlargement of the dental lamina in the lower jaw is situated in front of the enamel-organ of the first functional incisor; it is a very conspicuous structure in the younger stage, being slightly bell-shaped and possessed of a small labial outgrowth (Plate XXIII. fig. 3); this evidently corresponds with what Leche believes to be a remnant of the true $\overline{i.1}$ (see Taf. ii. figs. 13 & 14), which is here possibly represented both in the milk and permanent series.

The second incisor, *i. e.* the anterior functional one, is a very large and highly differentiated tooth in both specimens, and exhibits a strong lingual growth of the dental lamina, which eventually forms the enamel-organ of the successor, this tooth $\overline{i.2}$ being well developed in both dentitions.

The posterior functional incisor $\overline{i.3}$ is very backward in its development and variable, for it is larger in the younger of the two specimens examined. A long, narrow, cord-like (in section) band of cells grows out from the neck of the enamel-organ of this tooth on its labial side (fig. 4, $\overline{di.3}$), being sometimes swollen at its free end and slightly indented; this evidently represents the last trace of an earlier dentition, and from a comparison with di. 3 in the older stage, one is justified in concluding that it represents the enamel-organ of $\overline{di.3}$ undergoing suppression.

Between $\overline{i.3}$ and $\overline{c}$. the dental lamina is very strongly developed, and suggests the possible presence of the last trace of one of the missing Marsupial incisors.

The lower canine is represented by a bell-shaped enamel-organ attached to the buccal epithelium by a well-marked neck of dental

lamina; growing out from this labially is in both stages a small bud-like mass of cells (fig. 5, dc.), in one case swollen at its free end, close to which is a small irregular calcification similar in appearance to the often vestigial dc., but smaller in size: this is obviously the vanishing milk-tooth dc., the canine of the adult belonging to the replacing series.

The Premolars.

In the upper jaw there are three premolars, which Leche believes to be the 2nd, 3rd, and 4th respectively. It is true there is a slight gap between the canine and the anterior of these premolars, but there is a more conspicuous one between the two posterior teeth, and in this latter gap the dental lamina has a slight tendency to become specialized and enlarged (Plate XXIII. fig. 6 *b*); but it is perhaps hardly large enough to be regarded as a tooth anlage, and, further, we know that when suppression affects the premolar series in the Placentalia, the 1st tooth of that series generally suffers suppression earliest.

In the lower jaw there are only two premolars, but between them is a long stretch of dental lamina, which exhibits a most distinct development from its adamantine face; this growth is slightly indented by a specialized mass of mesoblast (fig. 7 *b*), the whole structure presenting a great similarity to a developing tooth: this, I believe, represents the last trace of a suppressed tooth, corresponding with the middle premolar above.

The two posterior upper, and the posterior lower, premolars are present as functional teeth in both dentitions; but the middle upper one is very variable, and is often wanting in some adult skulls, while in *E. micropus* and *E. pictus* it is very minute.

The anterior premolar, above and below, in both my stages, exhibits a large enamel-organ, bell-shaped in the older specimen; attached to the dental lamina forming the necks of these structures, on the labial side, is in each case a mass of epitheloid cells (figs. 8 and 8 *a*, dpm. 2); the free ends of these buds are swollen and flattened: closely applied to these is, in each case, an irregular calcification, resembling the most reduced stage of dc.; these are evidently reduced milk-premolars, the anterior functional premolars being then, as Leche supposed, replacing teeth.

With regard to the last premolar, its milk representative resembles a molar in form, thus differing markedly from its successor; a feature so characteristic of the 4th premolar of other Placentalia, that I think we may be quite safe in homologizing these two teeth with one another.

If we examine the mutual relations of the 4th premolar and its successor during their development, we find that the replacing tooth, ppm. 4, originates almost entirely in front of its supposed milk predecessor from the dental lamina between dpm. 3 and dpm. 4, the enamel-organ of ppm. 4 being more conspicuous in the sections in front and in the anterior region of dpm. 4 than in its posterior

region, thus resembling the condition which I described in the *Macropodidæ* (28. p. 467).

The antero-external cusp (protocone of Scott) of dpm. 4 develops first, the antero-internal or deuterocone second, and the tetarocone third, the tritocone being wanting.

The Molars.

Of the three molars of the adult, $\frac{m.1,\ m.2}{m.1,\ m.2}$ are alone developed in my specimens. The enamel-organs of these two teeth, both above and below, exhibit slight lingual continuations of the dental lamina; consequently these teeth do not develop in connection with the most deeply-seated portion of the dental lamina, but in relation to that situated nearer to the surface of the gum. The presence of this lingually-placed continuation of the dental lamina indicates that there is latent in the jaw the structure essential for the production of a second set of molars.

In addition to this lingual growth, we find also a slight but constant labial outgrowth from that portion of the dental lamina connecting the enamel-organ of the functional molar with the oral epithelium. If this labial growth be compared with the vestiges of the milk-dentition seen in connection with $\underline{i.3}$ and $\underline{i.2}$, it is found that it is impossible to distinguish these structures from one another, they being precisely similar in their relations to the dental lamina and to the adjacent teeth, differing only in the fact that the labial growth connected with the molars is the most reduced.

We find, then, in the molar region indications of three sets of teeth—a labial vestigial set, then a functional set, and lingual to this a structure capable of producing one or more replacing sets. Further consideration of these sets will be found in my general conclusions.

The Molar Cusps[1].

Erinaceus in the adult condition has three molar teeth in each jaw, the first of these being large, while $\frac{m.3}{m.3}$ are reduced.

The first two upper molars are quinquetubercular, being provided with two well-developed external cones, the paracone and metacone, two internal ones, the protocone and the hypocone, together with a small central metaconule, this last being the most variable constituent. In addition there is a slight but complete cingulum.

The lower molars (1 & 2) are also quinquetubercular, being modified trituberculo-sectorial teeth, in which the heel has

[1] In the descriptive portion of this paper Osborn's nomenclature of the molar cusps (13) is used, but I do not thereby imply that I believe in all cases the homology of the cones has been correctly interpreted; in fact, in the general summary I endeavour to show that the cusp usually termed the protocone in the Insectivorous molars is not homologous in all the genera.

attained equal importance with the trigon and developed two large cusps, an internal entoconid and an external hypoconid. This tooth is further specialized in the partial suppression of the paraconid, the antero-internal cone of the trigon, while the protoconid (antero-external) and the metaconid (postero-internal) are very large.

Taking the case of the upper molar first, in both my specimens m. 1 was fairly advanced, showing indications of four cones, viz., the para-, meta-, proto-, and hypo-cones, here mentioned in order of size; the hypo-cone was obviously the last of the four to develop, as it is only just recognizable in the younger specimen; in the older stage these cones are larger, and the first trace of the metaconule is here apparent. Thus in m. 1 we can say for certain that the metaconule appears last and the hypocone next to last, but the trigon was too advanced in my specimens to determine the developmental order of its cones. But where m. 1 fails us m. 2 comes to our rescue: in the younger stage two cones only were apparent, viz., the two external ones, the para- and metacones, and of these the former was much the largest and must obviously have developed first; immediately internal to this was a low shelf, in the position of the future *protocone*, but at present no cone was recognizable. In the older stage of this tooth the protocone has appeared in this position, and a faint indication of the heel is visible. We may thus state with certainty that the order of cusp ontogeny is as follows:—

1. Paracone
2. Metacone } Trigon.
3. Protocone
4. Hypocone.
5. Metaconule.

In the lower jaw, as in the upper, the first molar was too far advanced, all five cones being recognizable, but nevertheless differing greatly in their relative sizes; the following is their order according to size, viz., proto-, meta-, ento-, hypo-, and paraconid, the last being only just recognizable. An examination of m. 2 throws more light on the subject, for here only three cones are developed as yet, viz., the proto-, meta-, and entoconid, a slight antero-internal extension of the tooth-germ indicating the position of the future paraconid, while a similar but larger postero-external platform marks the hypoconid. The protoconid is larger than the metaconid at this stage, and the metaconid than the entoconid, the probable order of development being:—

1. Protoconid.
2. Metaconid.
3. Entoconid.
4. Hypoconid.
5. Paraconid.

The ordinal position of the paraconid in the ontogeny may

seem rather strange, but we must bear in mind the fact that this cusp is apparently of little importance in *Erinaceus*, as it is very small in adult and may be almost wanting on m. 2.

A further consideration of these cusps will be found at the end of this paper.

The relations of the milk and permanent teeth of *Erinaceus* may be represented as under, the reduced teeth being indicated in italics, those which never cut the gum and are entirely functionless being enclosed in brackets, while the functional ones are represented by ordinary figures (Winge, **26**) :—

$$\text{I.}\begin{cases}1\ 2\ 3\\ \dfrac{1\ 2\ (3)}{(1)\ 2\ (3)};\\ 2\ 3\end{cases}\quad \text{C.}\begin{cases}1\\ \dfrac{1}{(1)};\\ 1\end{cases}\quad \text{P.}\begin{cases}0\ 2\ 3\ 4\\ \dfrac{0\ (2)\ 3\ 4}{0\ (2)\ (3)\ 4},\end{cases}\ \text{or}\ \begin{cases}(1)\ 2\ (3)\ 4\\ \dfrac{(1)\ \ \ (3)\ 4}{};\\ 0\ 2\ \ 4\end{cases}\quad \text{M.}\begin{cases}1\ 2\ 3\\ \dfrac{\qquad}{};\\ 1\ 2\ 3\end{cases}$$

Gymnura.

So far as I am aware, no young specimens of this genus have been examined in the flesh for their tooth change. Thomas (**23**) has, however, published a bare statement of two dentitions in this genus, based, I believe, on a young, dried skull in the British Museum collection; but there is a good deal of uncertainty attached to this method, for although the jaw has been cut to expose the underlying tooth-germs, no actual germs are visible, and one can only surmise their existence from the presence of cavities at the roots of the functional teeth (Plate XXIV. fig. 12), and by a comparison of these teeth with those of an adult specimen.

The dentition, according to Thomas, is :—

$$\text{I.}\begin{cases}1\ 2\ 3\\ \dfrac{1\ 2\ 3}{1\ 2\ 3};\\ 1\ 2\ 3\end{cases}\quad \text{C.}\begin{cases}1\\ \dfrac{1}{1};\\ 1\end{cases}\quad \text{P.}\begin{cases}1\ 2\ 3\ 4\\ \dfrac{2\ 3\ 4}{0\ 3\ 4};\\ 1\ 2\ 3\ 4\end{cases}\quad \text{M.}\begin{cases}1\ 2\ 3\\ \dfrac{\qquad}{};\\ 1\ 2\ 3\end{cases}$$

di. 3 and dpm. 2 being vestigial.

The specimen examined by me was a fœtus, with a head length of about 49 mm. and a total length of 205 mm.

The Incisors.

I. 1 & i. 2 are large and well calcified, each showing a marked lingual development of the dental lamina, indicative of a successional tooth. On the other hand, i. 3 is more specialized, and only present in the permanent set of teeth. In my fœtus this tooth was very backward in its development, its enamel-organ being but slightly differentiated (pi. 3), and exhibited on its labial side a large irregular calcification (fig. 10, di. 3), provided with a reduced enamel-organ; this is evidently the milk predecessor of i. 3, and

probably would not cut the gum, although at times it may do so (Thomas, 23).

There is a complete replacement of the lower incisors, but the successors develop at very different times, $\underline{\text{pi. 1}}$ and $\underline{\text{pi. 3}}$ maturing long before $\underline{\text{pi. 2}}$. Consequently in my fœtus no sign of the future $\underline{\text{pi. 2}}$ was visible, although the enamel-organs of $\underline{\text{pi. 1}}$ and $\underline{\text{pi. 3}}$ were just recognizable. As a matter of fact $\underline{\text{pi. 2}}$ is, I believe, the last permanent ante-molar tooth to cut the gum, appearing soon after the eruption of $\underline{\text{ppm. 3}}$.

The Canines.

The milk-canines possess single roots, and are but slightly larger than the incisors (fig. 13); whereas the permanent canines are very large teeth, with pointed crowns, and each provided with two fangs.

The Premolars.

$\frac{\text{Pm. 1}}{\text{Pm. 1}}$ are said to be present in one dentition only. If this be the case these teeth would appear to belong to the milk-dentition, for there is present on the lingual sides of their enamel-organs well-marked continuations of the dental lamina, precisely similar in their relationship to that seen by the side of $\underline{\text{dc.}}$, which gives rise to the enamel-organ of $\underline{\text{pc.}}$, only the inner ends of the former are perhaps a trifle less swollen. It is just possible that these structures may give rise to the enamel-organs of successors at a late period, for the first premolar of the adult skull appears to be a slightly stouter tooth than that of the young animal.

The lingually situated dental lamina in both the upper and lower jaws gets smaller and more irregular behind pm. 1, but soon becomes definitely swollen, and forms the commencement of an enamel-organ (figs. 11 & 12, ppm. 2); this, from its position and backward condition, is evidently that of a successional tooth, viz., ppm. 2. This identification is rendered more certain by finding on the labial side of this structure a small calcified tooth (dpm. 2), devoid of enamel, but possessing a much reduced enamel-organ [1]. In the case of the upper tooth this reduced enamel-organ is attached to the gum close to, but independent of, the swollen, lingually-situated dental lamina above referred to ($\underline{\text{ppm. 2}}$). In the lower jaw, however, the enamel-organ of the vestigial tooth (fig. 12, $\underline{\text{dpm. 2}}$) is apparently attached to the corresponding lingual swelling of the dental lamina, thus exhibiting the normal relationships of a milk and a replacing tooth.

The deciduous 2nd premolar is then reduced and early lost, while its successor is somewhat precociously developed (*cf.* fig. 11,

[1] In a preliminary note, read before the British Association, 1895 (27), I stated that there were traces of five premolars in *Gymnura*: this is not the case; the error arose through a misinterpretation of a curious development of the pulp of this tooth, dpm. 2 (see Pl. XXIV. fig. 11, *p*), which was mistaken for a successor.

ppm. 2, and fig. 14, ppm. 3). The upper dpm. 2 is larger than $\frac{\text{dpm. 2}}{\text{dpm. 2}}$, possibly at times it cuts the gum; it is well seen in a specimen in the British Museum (fig. 13, dpm. 2), probably the one Thomas described; no trace of dpm. 2 is seen in that specimen, and it is probable that this tooth is either shed *in utero* or absorbed.

$\frac{\text{Pm. 3}}{\text{Pm. 3}}$ are quite normal, the milk representative being large, and the lingual growths of the dental lamina, which give origin to the enamel-organs of their successors, being conspicuously swollen (fig. 14, ppm. 3). This tooth is somewhat similar in the two dentitions, but distinctly larger in the adult.

$\frac{\text{Dpm. 4}}{\text{Dpm. 4}}$.—These are the largest and most complex of the premolars, and both exhibit conspicuous lingual specializations of the dental lamina, the enamel-germs of their successors. These germs are developed in front of the deciduous teeth, and although the lingually-placed dental lamina is continued back by the side of dpm. 4, it is no longer swollen to form an enamel-germ.

The Molars.

In the stage examined two molars were present, above and below, but save in the case of m. 1 no labial or lingual developments of the dental lamina were to be seen. M. 1, however, exhibited both a lingual and a slight labial growth, similar to those seen in *Erinaceus*.

The Cusps.

The molar teeth of *Gymnura* resemble those of *Erinaceus* in pattern; like that genus they exhibit five cusps, which are strongly developed, and in the upper jaw a well-marked cingulum, with a small anterior and posterior cusp, is present in addition; in the lower jaw the paraconid is less developed than in *Erinaceus*.

My fœtal specimen was rather old for an exact determination of the cusp ontogeny, most of the cusps being well-formed. In m. 1 all five cusps were present, and had attained nearly their full development; the following is their order in size: proto-, meta-, para-, and hypocones, the smallest being the metaconule. M. 2 was less developed, and here the para- and metacones were the most strongly developed, while the protocone was present in the form of a large antero-external shelf, but hardly as yet developed into a distinct cusp, though the hypocone and metaconule had done so.

Probable order of cusp-development:—

1. Paracone.
2. Metacone.
3. Protocone as a shelf.
4. Hypocone.
5. Metaconule.
6. Protocone as a cusp.

In the lower molar the protoconid evidently develops first, but it is closely followed by the metaconid, the entoconid, and the hypoconid, the reduced paraconid being last, the order being identical with that seen in *Erinaceus*.

The relation of the milk and permanent dentitions may be thus expressed:—

$$\text{I.}\begin{cases}1\ 2\ 3\\ \dfrac{1\ 2\ (3)}{1\ 2\ 3}\\ 1\ 2\ 3\end{cases};\quad \text{C.}\begin{cases}1\\ \dfrac{1}{1}\\ 1\end{cases};\quad \text{P.}\begin{cases}?\ 2\ 3\ 4\\ \dfrac{1\ 2\ 3\ 3}{1\ (2)\ 3\ 4}\\ ?\ 2\ 3\ 4\end{cases};\quad \text{M.}\begin{cases}1\ 2\ 3\\ \dfrac{\qquad}{\qquad}\\ 1\ 2\ 3\end{cases}$$

Sorex.

The Shrews are generally regarded as possessing one dentition only, but both Owen (18) and Trauber (25) stated definitely that there was a minute calcified milk-dentition present, Owen ascribing to *Crocidura* $\frac{4}{4}$ milk-teeth, while Trauber states that in *S. vulgaris* there are $\frac{7}{3}$ and in *Crossopus fodiens* $\frac{6}{3}$ deciduous teeth. Leche (9) believes that these authors mistook the calcifying cusps of the replacing teeth for a set of minute milk-teeth—he himself coming to the conclusion, from the material at his disposal, that only one dentition is present in *Sorex* and *Crossopus*; this he regards as the successional set, the milk-dentition having been suppressed.

My own observations are based on the examination of one stage only, but it appears to be in a very interesting condition and shows distinctly traces of two dentitions.

The specimen measured 32 mm. long, the head length being 8 mm., while from the crown of the head to the posterior flexure of the body it was 13 mm., being just 1 mm. shorter than Leche's youngest stage.

The Incisors.

$\frac{\text{I. 1}}{\text{i. 1}}$—These in the adult are two enormous procumbent teeth, and in my fœtal specimen are much in advance of the other teeth. The enamel-organs of these two teeth exhibit strong lingual growths of the dental lamina (Plate XXV. fig. 15, *d.l.*), so large and swollen, indeed, as to suggest the development of a successor; but such a condition could not possibly have been overlooked for it would involve the replacement of a large tooth at a comparatively late period, whereas the only suggested milk-teeth (Owen and Trauber) are said to be minute.

The 2nd upper incisor is backward in its development, but its enamel-organ exhibits a marked labial growth (fig. 16, $\underline{\text{di. 2}}$); this latter being swollen at its free end and slightly indented, evidently represented the enamel-organ of a predecessor to $\underline{\text{i. 2}}$ in a vestigial condition. A similar but non-indented labial growth is found related to $\underline{\text{i. 3}}$ (fig. 17), this condition being repeated in connection

with the fourth tooth, the so-called i. 4, but here the labial enamel-organ is more marked and bell-shaped (Plate XXV. fig. 18, dc.). The gap between the premaxilla and maxilla at this stage is so extensive that the germs of several teeth are contained within it, it being quite impossible to identify the future boundary line between maxillary and premaxillary teeth (fig. 19). But even if it be a fact, as Brandt states (1 *a*), that the four anterior upper teeth are situated within the confines of the premaxilla[1], I fail to see that it is proven that these teeth are the homologues of the four incisors seen in the Polyprotodont Marsupials, but would rather be inclined to regard Brandt's fourth incisor as a canine, abnormally situated; for among the Insectivora this tooth is very variable in its relations to the premaxillo-maxillary suture, due probably to the variations in relative extension of these two bones, the canine itself remaining constant in its position.

The 2nd and 3rd lower incisors were in a very backward condition; both, however, exhibit labial growths of the dental lamina, that connected with $\underline{i.2}$ being the most marked (fig. 20). The 3rd lower incisor is, however, a vanishing structure and does not develop into a functional tooth (fig. 21).

In the upper jaw the tooth which I regard as the anterior premolar, usually called the canine (Brandt), was difficult of identification, it being hardly differentiated from the dental lamina (fig. 19, pm. 2?).

Of the two undoubted premolars the posterior is the largest and the most advanced in development, the enamel-germ of the anterior tooth being still in the club-shaped stage, but possessing a well-marked cup-shaped labial (fig. 22) enamel-organ belonging to its vestigial predecessor. A similar structure to this, but more highly differentiated and of still larger size, is attached to the posterior premolar (fig. 23, dpm. 4), which, from its large size and close proximity to the molar teeth, is probably the true 4th premolar (ppm. 4).

These three teeth I regard as premolars; in all probability they represent pm. 2, 3, & 4.

The enamel-organ of the single lower premolar, like ppm. 4, was large and highly differentiated (fig. 24); it also exhibits the labial enamel-organ of its vestigial predecessor.

The Molar Teeth.

In the fœtus examined by me $\frac{\text{m. 1, m. 2}}{\text{m. 1, m. 2}}$ were distinguishable, but not very advanced in their development; $\frac{\text{m. 1}}{\text{m. 1}}$ exhibited slight lingual continuations of the dental lamina.

[1] A reference to Brandt's figures will show that it is only in *Crossopus* (fig. 2) that the 4 anterior teeth are quite within the limits of the premaxilla; in *Sorex* (fig. 1) the premaxillo-maxillary suture is so represented that the fourth tooth is situated in the gap between the two bones, a condition characteristic of the 4th tooth or canine of many Placentals.

Cusps.

The molar teeth of the adult belong to the trituberculo-sectorial type, the upper ones have square crowns bearing four cusps, *i. e.* 3 large equal ones belonging to the trigon and a small postero-internal cusp or hypocone. The lower molars are elongated, consisting of a trigon and a very large heel with two conspicuous cones (hypo- and entoconid); the cones in the lower trigon are not equally developed, the protoconid being much larger than the other two.

My specimen was too young to determine with any certainty the ontogeny of the cones, as only one of the main cones had made its appearance, the dental germ presenting the appearance of a high cone with a large posterior heel (metaconal region) and a slight internal extension. A plan of the dental germ at this stage shows that structure to be roughly triangular, the main and only cone being situated at the anterior extremity and slightly nearer the external border. From the position of this cone and from a comparison with the cusp ontogeny as seen in the molar of *Talpa*, with which it is identical in pattern, I think one may conclude that this single cusp is the paracone, the posterior extension representing the metacone, while the internal shelf indicates the position of the future proto- and hypocone.

In the lower jaw the main cusp is antero-external in position, and may be identified as the protoconid; a slight inward extension of the dental germ alone indicates the para- and metaconid, while a faint backward development foreshadows the future heel with its two cones.

The probable order of cusp-development is thus shown:—

1. Paracone.	1. Protoconid.
2. Metacone.	2. { Paraconid.
3. Protocone.	{ Metaconid.
4. Hypocone.	3. { Entoconid.
	{ Hypoconid.

A general examination of the Shrew's teeth shows that with the exception of $\frac{i.1}{i.1}$ and the almost undifferentiated 1st premolar, all the anterior teeth, viz. $\frac{i.2,\ i.3,\ C.\ (i.4),\ pm.3,\ pm.4}{i.2\ (i.3)\qquad\qquad pm.4}$, exhibit the labially situated enamel-germ of a predecessor, some of these being in a highly developed condition, possessing marked dentinal germs but no calcification. These structures, from a comparison with the teeth of other Insectivora, must be regarded as vestiges of that earlier developed set of teeth the milk-dentition: this homology is very striking when they are compared with the reduced milk-teeth seen in *Erinaceus*, and is rendered still more certain when we remember that there is indication of no other tooth replacement in the *Soricidæ*.

The relations of $\frac{i.1}{i.1}$ are very confusing, for the large develop-

ment of the lingually-placed dental lamina would certainly suggest that they should be regarded as persistent milk-teeth; but against this view we have the fact that all the other anterior teeth (incisors, canine, and premolars) are now shown to be permanent teeth with vestigial milk predecessors, and also that in all other cases among the Placentalia where the teeth (especially the incisors) undergo great enlargement, as is the case with $\frac{i.1}{i.1}$ of the Shrew, it is invariably the permanent teeth which are enlarged, and not unfrequently the corresponding milk-teeth are reduced and even aborted (*Lepus* &c.). This condition is so universal that I am inclined to believe that in the Shrew, in the case of $\frac{i.1}{i.1}$ as with the rest of the incisors &c., the milk set has been reduced, but that here this reduction has been carried further until all trace of di. 1 has been lost, this being due to the large size and earlier development of pi. 1, these latter being developed far in advance of the posterior teeth. The lingual growth of the dental lamina is comparable to that which has been observed in connection with the successional teeth in so many forms (Seal (**6**), Dog (**24**), &c.), and which is there regarded as evidence of the existence of a 3rd or 4th set of teeth which might replace the permanent set, and to which the term postpermanent dentition has been applied. This structure may owe its greater development in the Shrew to the early appearance of the permanent set and to the complete loss of the milk series.

The relations of these teeth may be expressed as follows, bearing in mind that the milk-dentition is functionless and probably uncalcified:—

$$\text{I.}\begin{cases}1\ 2\ 3\\ \dfrac{(2)\ (3)}{(3)};\\ 1\ 2\ (3)\end{cases}\quad \text{C.}\begin{cases}1\,(\text{i.}\,4)\\ \dfrac{(1)}{\quad};\\ 0\end{cases}\quad \text{P.}\begin{cases}0\ \ 2\,(\text{c.})\ \ 3\ \ 4\\ \dfrac{(3)\ \ (4)}{(4)};\\ 0\ \ 0\ \ \ \ 0\ \ 4\end{cases}\quad \text{M.}\begin{cases}1\ 2\ 3\\ \dfrac{\quad}{\quad};\\ 1\ 2\ 3\end{cases}$$

Centetes.

My material for the study of this interesting form consisted of two fœtal specimens of different ages, measuring respectively in total length 36 mm., head length 12 mm., and 70 mm. with a head length of 20 mm., together with young and adult dried skulls in the teaching collection of the Royal College of Science and the more numerous specimens in the British Museum.

The relations of the milk and permanent teeth of the Tanrec are fairly well known, the most striking being the non-replacement of the 3rd upper incisor. This is especially interesting on account of what we have seen in *Gymnura* and *Erinaceus*, where that tooth is likewise only functional in one dentition; but here the resemblance seems to stop, for in *Gymnura* and *Erinaceus* the functional third incisor undoubtedly belongs to the replacing or permanent

series, whereas in *Centetes* this tooth is developed nearly as soon as the undoubted milk-teeth and is shed about the same time as the members of that series.

On investigating the development of $\underline{i.3}$ no indication whatever of a reduced successor is to be met with, the dental lamina being completely fused with the enamel-germ of this tooth, and consequently exhibits no lingual development. On the other hand, a slight outgrowth from the enamel-organ itself is visible on the labial side (Plate XXV. fig. 25, *x*), very similar to that figured by Kükenthal (6) in the Walrus (Taf. iii. fig. 7, *rvz.*), and which he there regards as the remains of an earlier dentition. One might therefore be justified in regarding this structure in *Centetes* as the last trace of $\underline{di.3}$, and the functional tooth though early lost as $\underline{pi.3}$. I am, however, very doubtful as to the advisability of basing a conclusion upon such slight evidence, more especially as I have never observed an undoubted reduced labial tooth in such a position, vestiges of an *earlier* dentition being always, so far as I am aware, related directly to the dental lamina, *i. e.* to the neck of the enamel-organ of the replacing tooth and not to the modified body of that structure.

Nevertheless, from the entire absence of any trace of a successor to this tooth and from the fact that the milk-dentition appears to be undergoing reduction in most Insectivores, and especially from the condition of the 3rd incisors in *Gymnura* and *Erinaceus*, I venture to suggest that this single $\underline{i.3}$ of *Centetes* belongs to the permanent dentition, but that it is very early developed and shed with the milk-teeth.

It is interesting to note that in the closely allied genus *Hemicentetes* a 3rd upper incisor is present in the adult dentition; but although we know a little of the tooth change in this form (3. p. 75), yet we do not for certain know if this tooth is preceded by a functional milk-incisor.

The remaining incisors $\frac{i.1, i.2}{i.1, i.2, i.3}$ together with the canines and the three premolars above and below are all present as functional teeth in both dentitions.

A very marked gap is noticeable between the canines and the first functional premolars both above and below: this tends to confirm the generally accepted view that the missing premolar is the 1st of that series. Unfortunately the dental lamina has been completely aborted from this gap in both stages examined, so that no indication of a missing tooth could be found.

The diastemata between these teeth are much more pronounced in the older stage and still more so in the adult; and from what I have seen in this and other long-nosed mammals (polyprotodont Marsupials), I am led to conclude that this elongation of the jaw is a secondary one, acquired since the reduction in the tooth series. This to my mind accounts for the absence of all vestiges of the suppressed teeth, for, when recently suppressed, tooth-vestiges are generally found even in short-nosed forms. The presence of four upper molars in this form appears to point to a

very late elongation of the jaw, not to the retention of a primitive character.

The Molar Teeth.

In the younger of my two specimens $\overline{\text{m. 1}}$ alone was developed, while in the older stage two molars were present above and below; in the latter specimen a very strong lingual development of the dental lamina was noticeable in relation to $\frac{\text{m. 1}}{\text{m. 1}}$, that connected with $\overline{\text{m. 1}}$ being specially large (Plate XXV. fig. 26, *d. l.*), and a less marked but similarly related structure was observable in connection with $\overline{\text{m. 2}}$.

The Cusps.

The posterior premolars and all the molar teeth belonging to the upper jaw of this genus exhibit a high triangular crown surrounded by a low cingulum, this latter being most marked in the postero-internal region of the tooth (Plate XXVI. fig. 34); the trigon is characterized by the presence of 3 cusps, of which the antero-internal (5) is the dominant and is connected by an oblique ridge with the cusps usually regarded as the paracone and metacone respectively (2, 3)—this tooth apparently presenting an almost pure tritubercular type[1]. On examining $\overline{\text{m. 1}}$ in my oldest specimen, this tooth was found to be composed of a prominent main cone slightly inclined inwards, undoubtedly the protocone of the adult tooth; while growing out low down from the external surface of this main dental germ were two smaller cones—a slightly more pronounced anterior one occupying the position of the future paracone, and a less developed postero-external cone situated well behind the main cone, *i. e.* the exact position of the metacone. The order of cusp-development is given below:—

1. Protocone.
2. Paracone. } Nearly simultaneous.
3. Metacone. }

In the deciduous 4th premolar likewise the protocone develops first, but here the metacone is in advance of the paracone.

The lower molars and posterior premolar are beautiful examples of the tritubercule-sectorial tooth, consisting of a high trigon and a low slightly developed heel; the three cusps of the trigon are pronounced—the protoconid (antero-external) being the largest, the metaconid is next in size and almost hidden by the former as it lies immediately internal to it, the paraconid being the smallest and most anterior cusp.

The development of these cones is well seen in $\overline{\text{m. 1 \& m. 2}}$ of my older specimen, and it is at once obvious that the protoconid is the original dentine germ, the other cusps being later outgrowths from

[1] The upper cheek-teeth of *Hemicentetes* should be examined by tritubercularists, for in this genus a complete transition between the tricuspodont premolars and the trituberculate molars can be seen.

it; indications of the paraconid and metaconid are just visible as antero- and postero-internal shoulders to the main outwardly inclined cone (protoconid); of two former cones the metaconid appears to develop a trifle the earliest, as in $\overline{m.2}$ the paraconid is not yet visible; in neither teeth had the hypoconid yet made its appearance. The order of development is thus shown to be :—

1. Protoconid.
2. Metaconid.
3. Paraconid.
4. Hypoconid.

This same order of development is presented by the cusps of $\overline{dpm.4}$.

The probable relation of the dentitions is as follows :—

$$I.\begin{cases}1\ 2\ 3\\ \dfrac{1\ 2\ 0}{1\ 2\ 3};\\ 1\ 2\ 3\end{cases}\quad C.\begin{cases}1\\ \dfrac{1}{1};\\ 1\end{cases}\quad P.\begin{cases}0\ 2\ 3\ 4\\ \dfrac{0\ 2\ 3\ 4}{0\ 2\ 3\ 4};\\ 0\ 2\ 3\ 4\end{cases}\quad M.\begin{cases}1\ 2\ 3\ 4\\ \dfrac{\qquad}{\qquad};\\ 1\ 2\ 3\ 4\end{cases}$$

Ericulus setosus.

The dentition of this genus is somewhat specialized, inasmuch as there is a distinct reduction in number of teeth, the 3rd incisor above and below being, in addition to the 1st premolar, completely wanting. In the case of the functional teeth possessed by *Ericulus*, the replacement is complete and may be represented as follows :—

$$I.\begin{cases}1\ 2\ 0\\ \dfrac{1\ 2\ 0}{1\ 2\ 0};\\ 1\ 2\ 0\end{cases}\quad C.\begin{cases}1\\ \dfrac{1}{1};\\ 1\end{cases}\quad P.\begin{cases}0\ 2\ 3\ 4\\ \dfrac{0\ 2\ 3\ 4}{0\ 2\ 3\ 4};\\ 0\ 2\ 3\ 4\end{cases}\quad M.\begin{cases}1\ 2\ 3\\ \dfrac{\qquad}{\qquad};\\ 1\ 2\ 3\end{cases}$$

In a fœtal specimen examined, 78 mm. long with a head length of 23 mm., a slight differentiation of the dental lamina in the lower jaw was observed between $\overline{i.2}$ and $\overline{c.}$, indicating the last trace of $\overline{i.3}$; but above the reduction is more complete, for although there was a conspicuous gap present between $\underline{i.2}$ and $\underline{c.}$, yet all trace of the dental lamina was lost.

The canines develop close to the 2nd premolar, and no indication of the missing 1st premolar was to be found.

Examination of the 4th premolar shows that ppm. 4 develops conspicuously in front of dpm. 4, the former being distinctly between dpm. 3 and dpm. 4, but on their lingual side.

Only a slight lingual development of the dental lamina was observed in connection with $\frac{m.1}{m.1}$.

The upper molars, like those of *Centetes*, are of tritubercular form, but possess in addition one slight antero-external cingulum

cusp. The protocone is the largest cusp, while the para- and metacone form the outer border of the tooth and are separated by a slight notch only.

In the fœtus, in m. 1 the protocone forms the main mass of the tooth, while the para- and meta-cones form two rounded external shelves not at present conical; in m. 2 the protocone and a small antero-external paracone are alone visible. The order of formation being:—

1. Protocone.
2. Paracone.
3. Metacone.

The lower molars are trituberculo-sectorial, the heel being larger than in *Centetes* but still very low; here also the protoconid is the first to develop, but it is quickly followed by the paraconid and later by the metaconid; the hypoconid appears as a low backward continuation of the dentine germ, *i. e.* of the protocone, for it is a direct backward continuation of the base of that cone. The cusps develop in the following order:—

1. Protoconid.
2. Paraconid.
3. Metaconid.
4. Hypoconid.

In describing the upper molars of *Centetes* and *Ericulus*, I have regarded them, as is usually done, from a tritubercular standpoint; it is perhaps more correct to describe them as presenting a crown consisting of a large V-shaped internal cone sloping gently towards the external border of the tooth in the form of two ridges, which end in an external serrated margin consisting in *Centetes* of 4 small cusps (Plate XXVI. fig. 34, *a* & *b*, 1, 2, 3, 4), two of which (2 & 3) are regarded as the paracone and metacone. Internal the main cone (5) dips sharply down to an internal cingulum, which is slightly expanded posteriorly (7).

Talpa europæa.

It may seem unnecessary to reinvestigate the relationship of the milk and permanent teeth of the Mole, considering that all the details relating to these teeth appear to have been recorded by Spence Bate (1) as early as 1867, and that these have apparently been confirmed by Leche (9), who used the more modern method of serial sections; but unfortunately the former appears to have perpetrated one serious error, and the latter, owing to the fact that the specimens he examined where too young, has failed to rectify it. The point in question is the supposed presence of a needle-like deciduous first premolar in both jaws.

Reference to Bate's figures will show that he represents reduced but elongate needle-like predecessors to all the incisors, canines, and premolars, that preceding the 4th premolar alone being two-fanged and non-spicular in form.

On making an examination of the clarified jaws (Plate XXVI. fig. 29) of a young animal (hairless), one is immediately struck with the correctness of the greater part of these figures, but in respect to the first premolar they appear to be incorrect, for no trace is observable of Bate's dpm. 1. In order to be certain that I was not dealing with an abnormal specimen, I examined the clarified jaws of three specimens of about the same age as that studied by Bate, two others being cut one into horizontal and the remaining into frontal sections; three younger animals were also examined by the section method[1]. In all 10 half heads were investigated, and as these, obtained from various localities, all agreed amongst themselves in respect to the relations of the 1st premolar, I cannot but come to the conclusion that Bate's observations on this point are erroneous, and that the teeth which he describes as $\frac{\text{dpm. 1}}{\text{dpm. 1}}$ have no existence.

In the younger specimen all the deciduous teeth save the 1st premolar were well calcified, but the germs of the permanent teeth though distinct were but little differentiated. An examination of a horizontal section at this period (figs. 27 and 28) shows pm. 1 developing in a position precisely similar to that occupied by the reduced deciduous incisor, canines, and premolars; and, as is the case with the latter, the former exhibits a specialized portion of the dental lamina on its lingual surface, the only observable difference being that dpm. 1 is larger, uncalcified, and generally more backward than the other milk-teeth; also that the germ of ppm. 1 is slighter but might well be thought capable of developing at a later period. That this is not the case is seen from an examination of the older stage: here all the deciduous teeth are strongly developed and even dpm. 1 is now calcified (fig. 31); it is, however, very large and not at all of the nature of a vestigial needle-shaped tooth such as figured by Bate, but rather presents all the characteristics of the tooth regarded by him as ppm. 1. The permanent incisor, canines, and premolars (fig. 30) are now highly differentiated, with large enamel and dentine germs: a comparison of one of these with the indication of the germ of ppm. 1 (Plate XXVI. fig. 31, *d.l.*), shows that the latter is now less marked than in the earlier stage and is obviously aborting; consequently we may safely assert that it never attains any degree of specialization, but remains merely a slight swelling of the dental lamina.

The entire absence of any labial development from that portion of the dental lamina between the large enamel-organ of this tooth (dpm. 1) and the epithelium of the mouth, taken together with the position occupied by it, viz. one similar to that of the true milk-teeth, and the specialized thickening of the dental lamina on its lingual side, exactly resembling in appearance and position the true

[1] In all 3 stages were examined, including two specimens of stage 1, one of the 2nd, and five of the 3rd stage, all being older than Leche's stages.

(1) 55 mm. total length; 17 mm. head length.
(2) 58 „ „ „ 18 „ „ „
(3) 95 „ „ „ 30 „ „ „

successional teeth, shows conclusively to my mind that the first premolar is present as a calcified tooth in one dentition only, viz., in the milk-dentition; the milk-tooth ($\frac{\text{dpm. 1}}{\text{dpm. 1}}$) being very large and persisting in the adult along with the permanent teeth, a slight trace only of its successor being visible at a very early stage and only for a short period.

I must further conclude that the teeth figured by Bate as $\frac{\text{dpm. 1}}{\text{dpm. 1}}$ have no existence, his $\frac{\text{ppm. 1}}{\text{ppm. 1}}$ being in reality persistent milk-teeth.

I can only imagine that Bate was misled by the presence of the small needle-like teeth seen in connection with all the other antemolars into the belief that he had lost a similar one in connection with $\frac{\text{pm. 1}}{\text{pm 1}}$ during dissection.

Leche, while accepting Bate's account, which he was bound to do from the limited material at his disposal, states that pm. 1 was much more backward than the other milk-teeth, for while the latter had well differentiated enamel-organs, that belonging to pm. 1 was still club-shaped or only slightly advanced. Thus his specimens form with mine a perfect series, which together show that at no time is there more than one representative of pm. 1 differentiated as a tooth, *i. e.* dpm. 1, and only for a short period is there any indication of ppm. 1.

General Consideration of the Homology of Pm. 1.

Although there is undoubtedly but one calcified representative of pm. 1 present in the Mole, it is possible that some may be inclined to regard that tooth as belonging to the permanent rather than to the milk series; in that case the lingual growth of the dental lamina would have to be regarded as the representative of the post-permanent series, similar to that seen in connection with the permanent incisors and canines (fig. 28, *pc. dl.*). Such an interpretation has been adopted by Tims (**24**) for pm. 1 of the Dog and Pig[1], this author further stating his belief that in those cases (*Hyrax*, &c.) in which pm. 1 is duplicated, the two teeth represent the permanent and post-permanent series, and not the milk and permanent sets as one might suppose them to do. Against this possible interpretation of pm. 1 in the Mole may be urged in

[1] With regard to Tims's description of the 1st premolar of the Pig, in which he figures traces of three dentitions, I believe that there has been a mistake in the identification of the teeth, for which I am partially responsible, the sections and rough identification of the teeth being mine. On making a fresh and more careful examination of the sections, and comparing them with an older specimen, I find a very backward tooth-germ present between the canine and the supposed 1st premolar: this backward germ I take to be the true pm. 1, the tooth figured by Tims being dpm. 2; in that case the enormous development and swollen nature of the lingual growth of the dental lamina is accounted for, it being the germ of ppm. 2, while the labial growth must represent a trace of the pre-milk dentition.

addition the entire absence of any labial growth in connection with pm. 1, which one might naturally expect to find if the functional pm. 1 was ppm. 1, and if Bate's specimen was an exceptional one in which dpm. 1 had been retained.

One of the greatest difficulties met with in the study of tooth ontogeny is the want of a sure method for the determination to which set a given tooth belongs, for we may be dealing with a retarded member of an early set or an accelerated development of a later series, and, so far as I can judge, the identification can only be made through a study of the comparative morphology and phylogeny of the tooth, and not by its ontogeny alone. That the time of appearance of the enamel-organ does not help us is well seen in the Mole, where the germ of pm. 1 appears after the other milk-teeth and at the same time as pc.; but this latter tooth appears long before the other permanent teeth, so that if we took the time of appearance of these tooth-germs as a criterion we should have to conclude that the deciduous incisors, canines, and three posterior premolars belonged to one set, the 1st premolar and permanent canine to a second set, and the other permanent teeth to a third series, a conclusion which, I think, condemns itself in the mind of all those who have studied this subject. Such a suggestion was put forward many years ago by Wortman (31), who regarded the four molars of the Placentalia as belonging to four distinct sets of teeth; this view does not appear to have met with any general recognition, it being more natural to suppose that the dental lamina though temporarily fused with the germs of the anterior molars yet retains its individuality and grows back with the elongation of the jaw to form fresh teeth belonging to the same series as the more anterior molars.

The only doubt arising in my mind as to whether I am right in referring the first premolar, in the Mole and in all animals where it is only known in one dentition, to the milk-series and so terming it dpm. 1, is due to the appearance seen in *Erinaceus*; for if in that genus the apparent tooth-vestige which I have mentioned (*ante*, p 562) as occurring between the two posterior upper premolars really represents a lost premolar, then the anterior premolar of *Erinaceus* is the true pm. 1; and as further I have shown that the deciduous predecessor of that tooth is a vestigial structure, the functional tooth must be referred to the replacing dentition. Consequently, if the above premises be true, we have here an example of the suppression of dpm. 1 and a persistence of ppm. 1, a conclusion antagonistic to that which I have arrived at concerning this tooth in the Mole, and I could only suppose that the homology of this tooth (pm. 1) varies in different and closely related animals.

I have thought it only fair to give this possible objection to my view here, but, as I have already mentioned, this supposed vestige of pm. 3 in *Erinaceus* is very slight and has not been observed by Leche in any of his stages; so it is highly probable that this structure has no morphological importance, and Leche's identification of the 1st functional premolar in this genus as pm. 2 may be quite

correct, in which case the above objection would not hold, and the non-replaced pm. 1 may be regarded in all cases as a persistent milk-tooth.

The presence or absence of the 1st premolar appears to be intimately connected with the development of the canine, for in mammals, other than the Insectivora, it is commonly wanting or much reduced in all those forms possessed of a large canine tooth, while in those forms in which it is present in both dentitions the canine is either vestigial (*Hyrax*) or separated from the premolars by a wide diastema (*Tapirus indicus*). In the case with no succession to pm. 1, I should imagine that enlarged deciduous canine caused a slight decrease in size of dpm. 1, while the enormous permanent canine, which always develops early, caused a total suppression of ppm. 1; on the other hand, in those cases where pm. 1 is replaced, the non-development of the canines or their early removal forward allows the germ of ppm. 1 to mature and become functional. In forms such as the *Pecora*, in which both the canine and pm. 1 are wanting, this latter tooth was probably suppressed in some ancestor in whom the canine was well developed, and probably all trace of its germ has been lost, so that the subsequent loss of the canine has not caused pm. 1 to reappear; besides in these forms, as also in *Equus*, the posterior premolars have been so much enlarged that the anterior cheek-teeth became functionless and aborted.

Osborn (32) on palæontological evidence regards the single pm. 1 as a persistent milk-tooth.

The Molar Teeth of the Mole.

The lingual development of the dental lamina in relation to $\frac{\text{m. 1}}{\text{m. 1}}$ is most conspicuous, it being more strongly developed in the Mole and *Centetes* than in any other animals I have examined, so much so that it is highly suggestive of a rudiment of a successional tooth (Plate XXVI. fig. 32, *d.l.*); a similar but slighter growth is found in relation to m. 2.

The Cusps.

The molar teeth belong to the trituberculo-sectorial order; in the lower molars the heel is very large and bears two strong cusps; the heel in $\overline{\text{m. 1}}$ is larger than the trigon, but in $\overline{\text{m. 2}}$ and $\overline{\text{m. 3}}$ it is smaller; in all the protoconid is the largest and the paraconid the smallest of the main cusps; a small posterior cingulum-cusp is seen in $\overline{\text{m. 1}}$, while $\overline{\text{m. 2}}$ bears in addition a similar anterior cusp, in $\overline{\text{m. 3}}$ the anterior one alone is present. The upper molars (Plate XXVI. fig. 35) are mainly tritubercular, but a very small hypocone (8) is present; the protocone (7) is small, whereas the paracone and metacone (5 & 6), especially the latter, are very large and show a tendency to become crescentic or V-shaped, the summit of the cone being situated some distance from the outer border of the

tooth; at the horns of the crescents, *i. e.* at the anterior and posterior extremities of the outer border, and in the middle of this edge where the two crescents meet, slight additional cones are raised up; these, however, appear very late (Plate XXVI. fig. 35, *a* & *b*, 1, 2, 3, 4).

Though no less than four stages were examined, yet it was not quite possible to determine which cusp was the first to appear, for even in the earliest stage of m. 3 two slight prominences were already visible corresponding to the paracone and metacone. In the case of m. 1 and m. 2, three cusps were present in all stages, but of these the two external were alone conspicuous in the younger stages, the antero-external (paracone) being the largest, though in the adult it is smaller than the metacone; this, I think, shows that the paracone is the first to develop. The internal protocone (7) appears late as a low inward extension from the base of the paracone (fig. 32) and cannot possibly be regarded as the original axis of the tooth. The 4th cusp to appear is the small anterior external cusp, which is connected with the anterior slope of the paracone, the hypocone evidently appearing very late.

In the lower molars the protoconid forms the main axis of the dentine germ, and develops long before any of the other cusps, the next in order being the metaconid, followed by the hypoconid and entoconid, and lastly the paraconid. The heel itself minus its two cusps is developed very early before even the metaconid. The paraconid is especially late in its development; consequently the molar tooth before this cusp appears presents a very curious shape, the entire antero-external region of the dentine germ being absent.

Upper molars.	*Lower molars.*
1. Paracone.	1. Protoconid.
2. Metacone.	2. Metaconid.
3. Protocone.	3. Hypoconid.
4. Small antero-external.	4. Entoconid.
5. Hypocone.	5. Paraconid.

General Comparision of Results.

The 4th Premolar.

The homology of the 4th premolar of the Placentalia with the posterior premolar of the Marsupialia was first pointed out by Thomas, and there can be no doubt that this tooth in the two groups presents certain constant and striking features; thus dpm. 4 is nearly always molariform, whereas ppm. 4 is often almost unique in its pattern, being a highly specialized tooth, which in those cases where it resembles any other tooth has a striking similarity to dpm. 3 (*Hypsiprymnus*, *Canis*, &c.).

Some time ago I pointed out that in *Macropus* the so-called ppm. 4 developed from the dental lamina between dpm. 3 and dpm. 4 (**28**, pl. 36, fig. 19), and was evidently serially homologous

with those teeth, but differed from them in being retarded in its development.

While investigating the development of dpm. 4 and ppm. 4 in the Insectivora, I have kept the above conclusion in mind, and allowing for the differences in the condition of the dentition in these two groups (Insectivora and Diprotodont Marsupials) I find a strong confirmation of this view, that ppm. 4 represents a tooth originally situated in front of dpm. 4, but retarded in its development, and subsequently displaced backwards or overgrown by dpm. 4.

This condition is more marked in the upper jaw, where in three of the genera investigated ppm. 4 develops distinctly in front of dpm. 4, in two slightly so, while only in one does it develop distinctly lingual to dpm. 4 (this is in *Sorex* probably a specialized form).

The molariform condition of dpm. 4 is well marked, but while in some Insectivora ppm. 4 is distinct in pattern, in others it is also molariform—the former condition being more marked in other groups of mammals, in some of which (Carnivora and Marsupials) ppm. 4 is so distinct in the characters of its crown from its predecessor that, taken in connection with the developmental features above recorded, I am forced to the conclusion that *dpm. 4 is a true molar accelerated in its development and growing forwards over the top of the retarded true 4th premolar*, or, in other words, dpm. 4 is the only true deciduous molar, while the tooth usually termed ppm. 4 is really the milk, but non-deciduous 4th premolar.

The above would account for the striking differences in character between the supposed deciduous and permanent 4th premolars of the "Kangaroo Rats," where dpm. 4 is molariform, and ppm. 4 that marvellous compressed cutting-tooth, identical in pattern with the anterior premolar dpm. 3. So also in the Carnivora with regard to the upper carnassial tooth. I think it is easier to conceive that the anterior molar should be accelerated in its development in order to supply the young animal with a crushing-tooth, than to believe with Cope (2) that the mere fact of a tooth-germ being shifted in its position relative to the angle of the mouth would cause such a total change in the character of two tooth-germs which were supposed to develop side by side as sisters from the same region of the dental lamina.

It is only fair to state that Leche (9. pp. 103 and 139) after considering the views put forward by me in a former paper (28), still concludes that the successor to dpm. 4 is the true representative of that tooth in the permanent series.

The Molars.

I have already described in my detailed account of the development of the molar teeth the presence of outgrowths from the dental lamina, to which structure the enamel-organs on these teeth are attached and from which they have arisen, both of the labial and lingual side of these teeth; these outgrowths, though

more constant in connection with the 1st molars, yet were also found in the region of the 2nd molars in several genera.

The lingual continuation of the dental lamina was found in all six genera examined, whereas the labial growth was more irregular and only observed in three forms; this latter growth was most conspicuous in *Erinaceus*, where it was constant from the beginning of m. 1 to the end of m. 2.

A great deal of stress has been laid upon the presence of these structures, especially that of the lingual one, its presence having been said to prove that the molar teeth belonged to the milk-dentition. There is no doubt that if we simply compare such a section as fig. 26 (Plate XXVI.), representing the molar tooth of *Centetes*, with a developing milk-tooth which is known to have a successor, we should certainly conclude that the lingual growth of the dental lamina in the two cases was the same structure; and as it can in one case be shown to give rise to the enamel-organ of a replacing tooth, we might apparently be justified in concluding that in the case of the molar it represented a reduced enamel-germ of a permanent tooth, and that the molar tooth belonged in consequence to the milk-dentition. But it is now well known that we have in the Mammalia traces of three or four sets of teeth; and as it is highly probable that the Mammalia are derived from polyphyodont ancestors, it is possible that there might at any time appear traces of a polyphyodont dentition. It appears, then, to me that presence of a lingual continuation of the dental lamina does not necessarily imply that the labial tooth belongs to the milk-series; it might equally well belong to the permanent or to the post-permanent series, all traces of the earlier labial sets being lost, the lingual growth being not merely the enamel-germ of a successor, but the free end of the undifferentiated dental lamina, which may go on growing and producing fresh sets of teeth, as it does in the polyphyodont reptile, where it is the "anlage" of numerous enamel-organs.

Compare for a moment these two diagrams (p. 583): fig. 1 representing a section of the dental lamina of a reptile with a practically unlimited succession, while fig. 2 represents the milk-tooth of a mammal with a lingual development of the dental lamina, which is here known to give rise to a permanent tooth; we should not in this case be justified in concluding that "*m*" in fig. 2 was the homologue of 3 in fig. 1, merely because of the presence of this similar development of the dental lamina on its lingual side; we must either conclude that *m* is the homologue of 1 and the permanent tooth of 2, or perhaps 1 or both 1 and 2 have been completely suppressed, and therefore *m* is the homologue of 2 or 3 as the case may be. In fact we must start with the dental lamina from the gum, looking most carefully for labial rudiments, so as to be perfectly sure that none of the earlier sets of teeth have disappeared, before we can homologize the functional teeth, and we must naturally expect to find a lingual growth of the dental lamina constantly present, whether we are dealing with the 1st, 2nd, or 3rd sets, there being no reason to believe that there is an ultimate

set which terminates the series. This is borne out by the discovery by numerous authors (5, 7, 9, 20) of a lingual growth of the dental lamina by the side of the germs of the permanent teeth.

Fig. 1. Fig. 2.

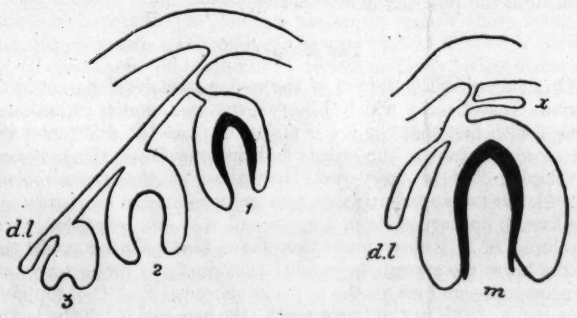

Fig. 1.—Diagram of the tooth-succession in a polyphyodont Reptile: 1, 2, 3, successive tooth-germs; *d.l*, dental lamina.
Fig. 2.—Diagram illustrating the relation of a molar tooth-germ (*m*) to the dental lamina (*d.l*).

Taking the above into consideration, the presence of *true and definite outgrowths* from the dental lamina nearer the gum than and thus labial to the molar germs is extremely interesting and suggests that possibly at least one set of teeth preceding the functional molars has been suppressed. These vestiges are, it is true, minute and variable, but when compared with the obvious vestiges of the anterior milk-teeth seen in *Erinaceus* it does seem rash to conclude that these labial growths in the molar region are the last indications of an earlier set of teeth.

If this is the case, then the molar teeth are not to be referred to the 1st, but rather to the 2nd dentition.

The question then arises, is the milk-dentition the 1st set of teeth? This has been answered in the negative by Leche, and I hope shortly to publish a further confirmation of this view.

Leche (7 *a*) has discovered in the anterior region of the jaw of *Myrmecobius* a minute set of teeth which precede the functional set; and as the latter set are now usually regarded as the milk-dentition, this vestigial series is termed the pre-milk series, and may be compared with those small embryonic teeth seen in the Crocodile (19 *a*) and Iguana (8)[1].

[1] Röse ("Das Zahnsystem der Wirbeltiere," Ergebnisse d. Anatomie u. Entwickelungsges., 1894) refers to traces of a pre-milk dentition in Man and suggests even an earlier set of teeth in the Vertebrata, a remnant of the placoid tooth-papilla, describing in all 5 sets, traces of at least four of which are found in the Mammalia.

I have adduced reasons elsewhere (29) to support the view that this pre-milk set, *i. e.* the first in order of time, has been completely lost in the molar region, and that these labial outgrowths of the dental lamina represent the now much reduced milk-dentition—the adult molars belonging to the 3rd or replacing set of teeth, the lingual continuation of dental lamina representing a potential 4th dentition, the post-permanent series.

The Molar Cusps.

On comparing the details of the molar cusp development in the various Insectivores which I have examined, one is immediately struck with fact that the lower molar cusps in the different forms are more constant in the order of their appearance, the *protoconid* developing first in every case, than those of the upper molars: these latter fall apparently into two groups—in one the *paracone* is the first to appear, while in the second it is the *protocone* which develops first. A closer inspection shows that a similar subdivision of the lower molars can be made; thus in those forms where the paracone appears first in the upper molars, we find the supposed homologue of this in the lower teeth (the paraconid)[1] is the last to develop, while those exhibiting the protocone as the first developed cusp above show the paraconid as second or third in order of development below.

These facts may be roughly tabulated thus:—

Group I. (4 genera).	Group II. (2 genera).
1. Paracone.	1. Protocone.
2. Metacone.	2. Paracone. } ? together.
3. Protocone.	3. Metacone. }
4. Hypocone.	
(5. Metaconule.)	
1. Protoconid.	1. Protoconid.
2. Metaconid.	2 or 3. Paraconid. } ? together.
3. Heel. { Ento. / Hypo.	3 or 2. Metaconid. }
4. Paraconid.	4. Hypoconid.

A further examination of these groups reveals the fact that they are separated from one another by a second feature, which is possibly of greater importance than that of cusp ontogeny; I refer to the fact that the members of group I. possess either quadri- or quinque-tubercular upper molars, while in group II. these teeth are trituberculate.

It will be seen, then, that in the only living mammals believed to possess unmodified trituberculate teeth (molars and posterior premolars) which have been examined developmentally, the order of cusp ontogeny is in entire accord with the supposed order of

[1] The condition of this cone in *Sorex* is uncertain.

cusp phylogeny as advanced by the supporters of the Cope-Osborn tritubercular theory. This is a very striking and important fact, and one which will no doubt be considered by trituberculists as strongly supporting their theory, especially as it is generally stated that these trituberculate Insectivores most nearly, amongst living mammals, approach the Jurassic Trituberculata in the character of their molars. This statement is certainly true for the lower jaw, but can be hardly said to hold for the upper molars, there being no resemblance between the teeth of the upper jaw of *Centetes*, *Ericulus*, and *Chrysochloris* [1] and those of *Peralestes*, and only an apparent one with *Kurtodon* (*Stylodon*), for Osborn (16) himself states that this latter is not trituberculate but ridged [2].

Turning now to the first group and examining it in the light of the supposed primitive nature of the protocone, we find here that the upper molar teeth are more complex, possessing 4 or 5 cusps, that the outer cusps (the para- and meta-cones) are more strongly developed than the inner ones; and in accordance with this we find both these cusps developing before the protocone—an anomalous condition when we remember that the last-named cusp is supposed to be the primitive axis of the tooth, the remaining cusps being mere outgrowths from it. Perhaps, if these Insectivora were the only forms possessed of such a condition, we might agree with Osborn (15) that this is merely a case of accelerated development; but they are not alone in this respect, for in Man (19), in some Ungulates (22), and in certain polyprotodont Marsupials (20), the paracone invariably develops first, the protocone being either 2nd or 3rd in order of appearance. In fact, in every mammal so far examined, with the exception of the two Insectivores before mentioned, the paracone develops directly from the primitive dental germ and before either the protocone or metacone. The constancy of this condition is such that I do not think we can pass over it so lightly as Osborn does, as may be seen from the following quotation (15. p. 503): "In fact the external cusps not only appear before the internal cusp, which palæontology shows to be the more primitive, but they assume the crescentic form earlier. *In other words, their development is accelerated.*" (Italics mine.)

If the protocone represents the summit of the original protodont tooth of the ancestor of the Mammalia, it must be the direct continuation of the primitive dentinal germ, and as such should be found to develop in a line with the axis of that structure. That this is not the case is well seen in fig. 32 (Pl. XXVI.), where the paracone (5) is found to be identical with the primitive dentinal germ and the protocone (7) appears as a mere internal ledge growing out from

[1] *Chrysochloris* is trituberculo-sectorial, possessing a small heel, and not a pure tuberculate as usually stated. Lydekker (10) compares *Peralestes* and *Chrysochloris*, but I fail to see the resemblance.

[2] It is very difficult to ascertain Osborn's views regarding *Kurtodon*, for in his large memoir (16. p. 210) he states that there is no real homology between the *Kurtodon* and *Chrysochloris* dentition, whereas in his additional notes (16 *a*) he appears to regard *Kurtodon* as one of the Trituberculata.

the base of this structure, the metacone and subsequently the hypocone being similarly derived from a backward extension of the base of the primitive dentinal germ. This primitive dentinal germ has, I believe, primarily a somewhat conical form in all cases, and one of the cusps of the adult tooth appears to be the direct continuation of this primitive cone, the remaining cusps being outgrowths usually from its base. It is *not* customary to find a blunt expanded table-like dentinal germ from which the cusps arise as secondary outgrowths—a condition which, it appears to me, must be necessarily assumed to support Osborn's view that the protocone is primary but retarded and the paracone its lateral derivative accelerated.

If it be the case that the paracone in the majority of Mammalia is the direct continuation of the primitive dentinal germ, and therefore of the single cone of the protodont mammalian ancestor, then we have the apparent anomaly of this primary cone giving rise, in the majority of forms, to the so-called paracone, *i. e.* the antero-external cone, while in a few it persists as the so-called protocone (antero-internal cone), a condition which suggests that the usually accepted identification of the cones of the *upper* molars is not in all cases the correct one.

It may be possible that in the above too much stress is laid on the ontogeny of the molar cusps; but, on the other hand, do we know sufficient of the phylogeny, as deduced from palæontological evidence, to prove that the primitive cone has in all cases been correctly identified in the upper molars? For though we have, thanks to the researches of Owen (17), Osborn (16), and Marsh (11), knowledge of a great number of Mesozoic mammals, yet the molar teeth found are nearly all lower ones, and but few upper molars (save multituberculate ones) are known until we reach Tertiary times[1], when the teeth have assumed forms whose cusps can be more easily homologized with those of living mammals than with the cusp or cusps of the Reptilian tooth or with that of the ancestral mammal. So that with regard to the evolution of the upper molars we are almost completely in the dark, for we know of no Triassic or Jurassic protodont upper molars, but three maxillæ (I believe) containing triconodont teeth, and but a few which, according to Osborn, contain tritubercular teeth.

I have tried to ascertain the exact number of *upper* jaws of Jurassic mammals possessing tritubercular molars or teeth approximating to that type, but have been unable to disperse the mystery which seems to envelop them. In England we certainly possess one specimen, which was described by Owen (17) as *Peralestes longirostris*, and is preserved in the British Museum; with this Owen associated a lower jaw which is now separated by Lydekker (10) from this form and assigned to *Amblotherium mustelula*. Owen also described four upper jaws, which he referred to *Stylodon pusillus*;

[1] Several isolated upper molars are known from the Upper Cretaceous rocks of N. America; some of these are said to be tritubercular (Osborn, "Mammals of tthe Upper Cretaceous Beds," Bull. Amer. Mus. Nat. Hist. 1893, p. 311), notably *Didelphops*, but this, though triangular possesses at least 6 cusps.

these have been separated from the lower jaws which Owen described under that name and placed in the genus *Kurtodon* (*Athrodon*) by Osborn (**16**), who first stated that they were not tuberculate, but now (**16** *a*) apparently regards them as examples of tritubercular molars.

In America, Marsh (**11**) has published the briefest note of the discovery of two upper jaws of *Dryolestes* and a single upper jaw of *Diplocynodon* (**1** *c*, 8 cheek-teeth); these he has not figured, and his descriptions fail to show that they are tritubercular; in the case of *Dryolestes* he does not mention the cusps, while in *Diplocynodon* he mentions 5 cusps the arrangement of which does not suggest trituberculy.

In 1888 Osborn (**16** & **16** *a*) described the upper molars of *Kurtodon* (see *ante*), *Peralestes*, *Diplocynodon*, and also of the *Stylacodontia*, under which latter head he places *Dryolestes*, but on referring to this genus he states that the upper jaw is unknown!

In a later work (**14**) he only mentions the upper molars of *Spalacotherium* and of *all* the *Amblotheriidæ* as being tritubercular; evidently he refers *Peralestes* to *Spalacotherium*, as suggested by Lydekker (**10**), and *Kurtodon* to *Amblotherium* (Owen). These remarks will show what little material we have upon which to base the existence of the Jurassic tritubercular upper molar which is an essential feature in the tritubercular theory.

A perusal of Osborn's (**16**) description of the upper molars of *Peralestes* shows, however, that they are anything but typical tritubercular teeth, for instead of possessing one internal and two external cusps arranged in a triangle, the inner cusp forming the apex, we find *two internal* cusps[1], of which the anterior is the largest, and a serrated ridge extending along the external border bearing several small cusps; and as the anterior of these is slightly enlarged Osborn terms it the paracone, calling the two internal cones respectively the protocone (anterior) and the metacone (posterior). Now, according to the tritubercular theory, the metacone should be external and in a line with the paracone, not internal in a line with the protocone. Moreover, an examination of Osborn's figure and of the specimen shows that what he terms the paracone is here developed as an enlargement of the external cingulum and is not in any sense serially homologous with the metacone.

A comparison of Osborn's two published figures of these teeth shows considerable differences in them, and on examining the actual specimen one finds that the figure in his large monograph (**16**) is the most accurate, the more frequently copied figure (**13**) being rather exaggerated in favour of trituberculism; but with all he seems to have overlooked a small cusp on the antero-external shoulder of his protocone and between this main cone and this external paracone, which, to my mind, far better suggests the anterior homologue of the metacone (see Pl. XXVI. fig. 33) and consequently the paracone from a tritubercular standpoint, although I believe this tooth to be capable of a totally different interpretation.

If this tooth be compared with the molar teeth of the living Insectivora (figs. 34–36), it appears that the tuberculate external

[1] The specimen shows three internal cusps, see fig. 33.

cingulum seen in *Peralestes* is comparable with the similar structure so frequently present in this group, and well exemplified in the upper molars of *Talpa*. If so, it becomes further evident that the two larger cusps of *Peralestes* represent the paracone and metacone of these living forms, these cusps being commonly developed quite a long distance from the external border of the tooth (*Talpa*, fig. 35). Consequently the internal shelf, which we have seen in living Insectivores bearing the proto- and hypocone, is not developed in upper molars of *Peralestes*.

If this comparison is correct, we are justified in concluding that the upper molars of this fossil form were not tritubercular in the sense understood by the supporters of the Cope-Osborn theory, and, further, those of *Kurtodon* being undoubtedly ridged and not tuberculate, while those of *Dryolestes* and *Diplocynodon* are either undescribed or possess 5 cusps, we consequently have no palæontological evidence to support the assumption that a tritubercular stage was passed through by the mammalian *upper* molar in its evolutions from a protodont or possibly a triconodont tooth. Under these circumstances I see no reason to believe that the primitive cone must necessarily occupy an antero-internal position such as Osborn's protocone does.

Palæontological evidence being then wanting or so fragmentary, we are obliged to fall back on the less torn pages of ontogeny. On doing so, we find that the upper molar cusp, which develops first and as a direct continuation of the dental germ in the majority of the Mammalia, is the antero-external or paracone: this I think is strongly in favour of the view put forward by Röse (**19**), that the paracone is the most primitive cusp, though I think it would be rather confusing to apply Osborn's term "protocone" to it, seeing that this term has been already applied to another cusp in the same tooth.

Of the primitive nature of the paracone we have slight palæontological evidence if, as I have suggested, the largest cone of the *Peralestes* upper molar (Osborn's protocone) is the homologue of the paracone of living Insectivores. But if we further include the molariform premolars in our study, we find this view is supported both by ontogenists (**22**) and palæontologists, for Scott (**21** *a*) has proved, and Osborn and Wortman (**32**) have accepted his conclusions, that the antero-external cone in these teeth is the primitive one from a palæontological standpoint, and Taeker has shown in the Ungulates, and I myself in the Insectivora, that this antero-external cone in the premolars develops first in the ontogeny of the premolar cusps.

With regard to the tritubercular upper molars of the *Centetidæ* &c. (fig. 34, *a* & *b*), I should conclude that the main cone of this type of tooth, usually termed the protocone, was really the paracone: the whole tooth representing only the antero-external triangle of such a form as *Talpa* (fig. 35, *a* & *b*), *i. e.* the crescentic paracone with its two external cingulum cusps, the two last named being commonly but incorrectly described as the para- and meta-cone in *Centetes*: that in the *Centetidæ* no marked indications of the protocone

or metacone are as yet visible, while in *Chrysochloris* (fig. 36. 7) the first indication of the protocone has appeared, viz. the internal shelf.

This attempt to homologize the main cone of the upper molars of the *Centetidæ* and *Chrysochloris* with the paracone of other Insectivora is a modification of the view put forward by Mivart in 1868 (**12**). He regarded the tricuspid triangular crown of the molar teeth of *Centetes* as a concentration of the eight cusped teeth of *Talpa*. An examination of his figures and description will show that he believed the so-called paracone and metacone of *Centetes* and *Chrysochloris* to be external cingulum cusps, the main cone of these teeth being formed by a fusion of cones corresponding to the para- and metacones of *Talpa*, while the protocone and hypocone of the latter he regards as represented by the small internal lobe seen in *Chrysochloris*[1]. This view accords in its most important respects with mine, but I do not think that the ontogeny of the tritubercular insectivore molar justifies Mivart's fusion theory, but rather suggests that this tooth corresponds only with the paracone triangle of the Mole's tooth.

Such an interpretation would bring these forms into entire accord with the other Insectivores and the Mammalia in general, and we should then find that the cusp which directly continues the dental germ, and consequently is the first to develop, is in all cases homologous, though unfortunately the same name has not been applied to it in all cases.

Thus the primitive cone of the upper cheek-teeth of the ancestral mammal finds its homologue in the protocone of the premolar, in the paracone of most molars, but in the protocone of the molars of the tritubercular Insectivores and *Peralestes*. This has been proved ontogenetically for both the premolars and molars, phylogenetically also in the former, while in the latter the phylogeny of the primitive cusp is still doubtful.

The evolution of the primary cusp of the premolars and molars is now brought into harmony, and it is no longer necessary to suppose that the cusp arrangement of two teeth such as pm. 4 and m. 1, often identical in pattern, have evolved upon different lines.

To briefly recapitulate my conclusions:—

(1) The antero-external cone, or paracone above and protoconid below, is the primitive cone both in the molars and premolars.

(2) The protocone is borne on an internal shelf of secondary origin (internal cingulum).

(3) The metacone is a similar backward development of the paracone, arising very early long before the protocone.

(4) The hypocone stands related to the metacone as the protocone does to the paracone.

(5) The paracone as the primary cone in the upper molars finds its homologue in the protoconid below[2].

[1] Unfortunately the cones have been incorrectly lettered in his figure of the upper molar of *Chrysochloris*, as may be seen on reference to his description.

[2] A paper by Winge (**26**) in Danish evidently upholds the same view, viz., that the *paracone* is the homologue of the *protoconid*; unfortunately I am unable to read the paper, but his lettering in his plate and diagrams are very clear on this point.

(6) The evidence advanced in support of the tritubercular theory is insufficient to prove that the upper molars primarily evolved on the lines of that theory.

(7) Owing to want of material, trituberculists have been led to assume that the upper molars of the early Mammalia passed through similar stages to those which they have determined for the lower teeth, and consequently they have in most cases incorrectly identified the primary cone (save in *Peralestes* and the living *Centetidæ* and *Chrysochloris*).

(8) That as regards the primary cone, its ontogeny recapitulates its phylogeny.

I do not mean to deny for one moment the occurrence of the tritubercular type of upper molar tooth, nor even to underrate its phylogenetic importance; for no one who has studied cusp ontogeny can fail to notice the frequency of its appearance, and the fact that often (though not always) the three cones of the trigon are the first to appear during development. What I desire to point out is, that there is no evidence to show that this type of upper molar arose in the way suggested by trituberculists, and that they have in most cases overlooked the true primary cone.

If the triconodont tooth be a stage in the evolution of the mammalian molar, then I should believe that the anterior cone disappeared, the main cone becoming enlarged as the paracone and the posterior one as the metacone. At this stage the upper teeth overhang and bite outside the lower molars, and the future antero-internal cone (protocone) was developed as an internal shelf acting as a mortar for the cusps of the lower teeth, and at a much later period developed a cusp. The hypocone arose in a similar way with the elongation of the teeth.

The function and origin of the external cingulum with its numerous cusps (2–4) is difficult to understand, for in the living Mole it is quite outside and free from all contact with the lower molars; possibly it is of use to insect-feeding animals, giving them greater hold of their slippery prey.

In the *Centetidæ* and *Peralestes*, the upper molars could not have overhung the lower ones to the same extent, consequently no internal lobe bearing the protocone was developed and the external cingulum was very largely developed.

I have purposely left out all reference to the multituberculate and concrescence theories, having restricted my researches to endeavouring to ascertain whether the trituberculate theory respecting the upper molars rested upon any solid basis, and whether one of the molar cusps was more primitive in its mode of origin than the others.

Ontogenetically, I have failed to find any support for the concrescence theory, neither do I consider that any of the evidence put forward by Röse and Kükenthal is at all conclusive in its favour.

On comparing the several families which grouped together

compose the order Insectivora, we find a considerable variation in their dentition, both as regards the number of their teeth and the specialization of the individual members of the dental series.

Thus in *Gymnura* and *Talpa* we find in the adult the full placental dentition of 44 teeth, while in two Shrews (*Diplomesodon* and *Anurosorex*) the dentition is reduced to 26 teeth, other families presenting numerous stages intermediate between these two. If *primitive*, the supposed presence of 4 upper incisiors in *Sorex* and the 4 upper molars of *Centetes* must be of great interest, but the former I believe is capable of being interpreted differently, and the latter to be a secondary character.

A closer examination of these dental variations shows that they can be grouped under four heads:—

(1) A tendency for a suppression of the 3rd incisor above and below, di. 3 disappearing first.
(2) A suppression in the premolar series, pm. 1 in the *Centetidæ*, pm. 2 in *Selenodon*.
(3) A suppression of the posterior molars, the number varying from $\frac{4}{3}$ to $\frac{2}{2}$, the normal number being $\frac{3}{3}$.
(4) A tendency for reduction in the functional importance of the milk dentition.

Although representatives of only 5 out of the 9 families of the Insectivora (Flower and Lydekker, **4**) have been systematically examined, this last variation is so marked, that one is forced to the conclusion that the order as a whole is tending to lose its milk-teeth.

Among the forms examined, probably only *Ericulus* and *Echinops* possess the same number of functional milk and permanent antemolar teeth, but these forms have already a reduced dentition. Of those provided with 44 teeth, viz. *Gymnura* and *Talpa*, we find in the former $\frac{\text{di. 3, dpm. 2}}{\text{dpm. 2}}$ reduced and functionless, while in *Talpa*, omitting the 1st premolar, all the remaining milk-teeth are reduced and though cutting the gum can hardly function (if at all) for more than a week or two.

The remaining genera examined show this reduction in a varying degree, the maximum being attained in *Sorex*, where in all probability the entire milk series is reduced and functionless.

If then it be a fact, as is now generally believed, that the milk dentition preponderates in the early Mammalia and in the living Marsupials, then we must come to the conclusion that the living Insectivora are specialized forms tending towards a Monophyodont condition in which the preponderating dentition is the replacing or permanent set.

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EXPLANATION OF PLATES XXIII.–XXVI.

In all cases the teeth represented are from the left side, and when shown in section the anterior surface is represented, so that the left side of the Plate represents the lingual and the right the labial side of the jaw.

Plate XXIII.

Figs. 1–8 *a*. *Erinaceus*.

Fig. 1. Frontal section of the developing canine. *dc.*, upper deciduous canine; *pc.*, germ of permanent canine.
1 *a*. Ditto. Older stage. Deciduous canine calcified.
2. Frontal section of the developing 3rd upper incisor. *di.* 3, vestigial milk-incisor; *pi.* 3, germ of permanent tooth.
2 *a*. Ditto. Older stage. Vestige of *di.* 3 and neck of the enamel-organ of the functional tooth (*pi.* 3).
3. Frontal section of vestigial lower incisor, $\overline{i.\,1}$.
4. Germ of 3rd lower incisor ($\overline{pi.\,3}$). $\overline{di.\,3}$, probable last trace of deciduous tooth.
5. Developing lower canine ($\overline{pc.}$) with its vestigial milk predecessor ($\overline{dc.}$).
6. Three sections through the dental lamina between the 2nd and 3rd functional upper premolars. (These should incline from left to right.)
7. Ditto between the two lower premolars; $\overline{pm.\,3}$, germ of missing premolar.
8. Germ of 1st functional upper premolar ($\overline{ppm.\,2}$) with vestigial milk predecessor ($\overline{dpm.\,2}$).
8 *a*. Germ of $\overline{dpm.\,2}$ and $\overline{ppm.\,2}$.

Plate XXIV.

Figs. 9, 9 *a*. *Erinaceus*.

Fig. 9. Upper jaw of a young *Erinaceus*, side view. After Leche.
9 *a*. Ditto. Palatal aspect of adult.

Figs. 10–14. *Gymnura.*

Fig. 10. Developing 3rd upper incisor (*pi.* 3) with calcified vestigial milk predecessor (*di.* 3).

11. Germ of 2nd upper premolar (*ppm.* 2) with reduced milk predecessor (*dpm.* 2).

12. Germ of 2nd lower premolar (*ppm.* 2), milk predecessor (*dpm.* 2) still more reduced.

13. Upper jaw of *Gymnura*, showing milk dentition and cavities occupied by germs of permanent teeth. *m.* 1, first molar; *dpm.* 2, 2nd deciduous premolar.

14. Germ of *dpm.* 3 and *ppm.* 3, the latter just appearing.

PLATE XXV.

Figs. 15–24. *Sorex.*

Fig. 15. Developing 1st lower incisor (*pi.* 1), lingual growth of dental lamina (*d.l.*).

16. Germ of *pi.* 2 with labial vestigial milk predecessor (*di.* 2).

17. Ditto, *pi.* 3; ditto, *di.* 3.

18. Ditto, permanent canine, *pc.* (i. 4); ditto, *dc.*

19. Plan of enamel germs of upper teeth in relation to the dental lamina and to the jaw-bones (*pmx.* and *mx.*).

20. Germ of *pi.* 2 with labial vestigial milk predecessor (*di.* 2).

21. Ditto of *pi.* 3 and *di.* 3 (vestigial).

22. Ditto of *ppm.* 3 and *dpm.* 3 (vestigial).

23. Ditto of *ppm.* 4 and *dpm.* 4 (vestigial).

24. Ditto of *ppm.* 4 and *dpm.* 4 (vestigial).

Figs. 25–26. *Centetes.*

Fig. 25. Germ of *i.* 3.

26. Germ of *m.* 1, showing specialization of lingually placed dental lamina (*d.l.*).

PLATE XXVI.

Figs. 27–32. *Talpa.*

Fig. 27. Horizontal section of the upper jaw, showing the tooth germs in relation to the dental lamina; the milk-teeth are well developed, while the germs of the permanent teeth are just visible as swellings of the dental lamina.

28. Enlarged drawing of a deep horizontal section passing through the germs of *dc.*, *dpm.* 1, *dpm.* 2, *dpm.* 3, and those of their successors in the permanent series. *pc.* very advanced; *ppm.* 1 transitory, never becoming more developed.

29. Clarified jaw of a very young Mole (hairless), showing the milk and permanent dentitions *in situ*.

30. Frontal section of a specimen about the same age as the last, showing *dpm.* 2 well calcified and the germ of *ppm.* 2.

31. Ditto, ditto, passing through the first premolar (*dpm.* 1), showing last trace of the lingual dental lamina (*d.l.*).

32. Ditto of a young stage, passing through the germ of *m.* 1, showing the primitive dentine germ giving rise to the paracone ($\bar{5}$), and the first trace of the protocone ($\bar{7}$), also a very prominent swollen lingual development of the dental lamina.

Fig. 33. (*a*) palatal, (*b*) external aspect of an upper molar (*m.*) tooth of *Peralestes*.

34. Ditto, ditto of *Centetes* (*m.* 1).

35. Ditto, ditto of *Talpa* (*m.* 2).

36. Ditto, ditto of *Chrysochloris* (*m.*).

The numerals attached to the last 4 figures represent an attempt to homologize the cusps.

4. Notes on the Breeding of the Surinam Water-Toad (*Pipa americana*) in the Society's Gardens. By A. D. Bartlett, Superintendent.

[Received May 5, 1896.]

In the early part of last year we were surprised to find one of the females of the Surinam Water-Toad in the warm tank at the Reptile House with her back covered with eggs, the uniform and

Fig. 1.

Surinam Water-Toads *in copulâ*.

regular arrangement of which caused us a considerable amount of speculation as to how they had been placed there[1]. The old story of the female depositing her eggs on land and afterwards

[1] See Mr. Sclater's remarks on this subject, P. Z. S. 1895, p. 80.

having them arranged on her back by the male was at once dismissed as a fable, as we now know that these animals do not voluntarily leave the water. Along with Mr. A. Thomson, the head keeper, and the two keepers at the Reptile-house (Tyrrell and Tennant), I therefore determined, should the opportunity

Fig. 2.

Surinam Water-Toad (♀) after deposition of eggs.

again occur, to watch constantly with the hope of being able to solve this unknown problem. About the 28th of April of the present year the males of this species become very lively, and were constantly heard uttering their most remarkable metallic, ticking call-notes. On examination, we then observed two of the males clasping tightly round the lower part of the bodies of the females

(see fig. 1, p. 595), the hind parts of the males extending beyond those of the females. On the following morning Tennant, the keeper, arrived in time to witness the mode in which the eggs were deposited. The oviduct of the female protruded from her body more than an inch in length, and the bladder-like protrusion being retroverted passed under the belly of the male on to her own back. The male appeared to press tightly upon this protruded bag and to squeeze it from side to side, apparently pressing the eggs forward one by one on to the back of the female. By this movement the eggs were spread with nearly uniform smoothness over the whole surface of the back of the female, to which they became firmly adherent (see fig. 2, p. 596). On the operation being completed, the males left their places on the females, and the enlarged and projected oviduct gradually disappeared from one of the females. In the other female, the oviduct appears not to have discharged the whole of the eggs. At any rate it remains distended, as shown in the figure, but is gradually shrinking in size [1].

May 19, 1896.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

Mr. Sclater exhibited a Daguerreotype portrait of what was believed to be the first Gorilla (*Anthropopithecus gorilla*) that was ever brought alive to Europe. This portrait had been lent to Mr. Bartlett by Mr. Alexander Fairgrieve, formerly connected with Wombwell's Menagerie. The animal in question was imported to Liverpool from the Congo by the late Mr. Hulse, animal dealer, in 1855. It was a young female, and was called "Jenny." Mr. Hulse sold it to Mrs. Wombwell, who kept it several months and made a pet of it. On its death the body was sent to the late Charles Waterton of Walton Hall, who preserved the skin and sent the skeleton to the Leeds Museum. Out of the skin of this Gorilla, Waterton manufactured a figure with two horns on the head, which he called Martin Luther, and exhibited in his gallery at Walton Hall. Mr. Bartlett, on seeing this stuffed figure at Walton Hall, had immediately recognized it as being that of a young Gorilla.

Mr. Sclater called attention to the fact that the large chalk drawing of the Gorilla hung in the Society's Meeting-room represented this same specimen, which was stated on the label of the picture to have been living in Mr. Wombwell's Menagerie.

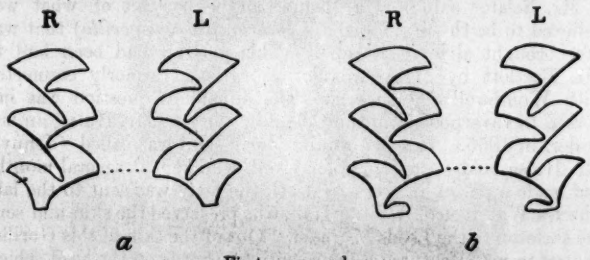
[1] [May 22nd.—This specimen died, and was sent to the British Museum. Mr. Boulenger examined it and kindly reports as follows:—"The uterus contained a good number of ripe ova, so that only a few could have been laid when the male abandoned the female. The ovipositor, formed by the cloaca, was still protruding and much inflamed. It may be deduced from the observation made by Tennant, that fecundation must take place before the extrusion of the eggs, and it is probable that the ovipositor serves in the first instance to collect the spermatozoa which would penetrate into the oviducts, the eggs being laid in the impregnated condition, as in tailed Batrachians."—P. L. S.]

The following papers were read:—

1. On a Variation in the Pattern of the Teeth of a specimen of the Common Field Vole. By G. E. H. Barrett-Hamilton, F.Z.S.

[Received April 27, 1896.]

The pattern of the molar teeth of the Voles has always been regarded as an important feature in the classification of these animals. Of these teeth the first lower and third (last) upper show the most important specific and subgeneric characters. The remainder vary much less among the various species and subgenera than do the above, and of these the first upper is undoubtedly the most constant. As will be seen from the figure (*a*), the first upper molar has five cement-spaces with three external and three internal angles. The first cement-space is placed anteriorly, the second and fourth on the inside, and the third and fifth on the outside of the tooth. This is the form of the tooth throughout the genus *Microtus*, and the same pattern occurs also in the allied genera *Euotomys*, *Synaptomys*, *Myodes*, *Fiber*, *Neofiber*, and *Ellobius*. In *Siphneus* the pattern is indistinct, and *Cuniculus* has seven cement-spaces.



First upper molars.

Diagram of typical teeth of *Microtus agrestis* (for comparison).

Diagram of abnormal teeth of *Microtus agrestis*.

This tooth is, therefore, singularly constant in its pattern, and the variation described in the present paper, occurring in a specimen of *Microtus agrestis*, is on that account of some interest, as there is little doubt that had the specimen been received from some unknown or distant region, it would probably have formed the basis of a new species or perhaps even of a new subgenus. The variation, which occurs in the first upper molar on each side, is well shown in the figure (*b*) and requires only a few words of description. It consists of an extra small, but distinct internal cement-space, formed by an additional folding inwards of the enamel. The first molars in this specimen have therefore six

cement-spaces, with four inner and three outer angles. It is interesting that this variation should occur in a species in which the presence of five cement-spaces in the second upper molar (as distinguished from *four* in nearly all other Voles) is characteristic.

The specimen in which the variation occurs is now in my collection (no. 75). It is a very large male, and was killed by Mr. J. Lewis Bonhote, at Jerkin in Norway, on July 28, 1895.

2. On the Existence in Europe of Two Geographical Races, or Subspecies, of the Common Field Vole. By G. E. H. Barrett-Hamilton, F.Z.S.

[Received May 18, 1896.]

I wish to call attention to the existence in Europe of two distinct forms of the Common Field Vole (*Microtus agrestis*, Linn.). My own attention was first drawn to this fact on the receipt of some Voles, which Mr. J. Lewis Bonhote was good enough to collect for me in Norway. These Voles, although differing externally, especially in size, and in cranial characters from English specimens, possess dental characters which are identical with those of the Common Field Vole as found in England.

The existence of these two forms appears to have been noticed so long ago as 1841, in which year Jenyns[1] described as a new species (thus confirming the opinion of William Thompson of Belfast, to whom he wished to give the credit of the discovery) under the name of *Arvicola neglectus*, Thompson, some Voles collected by Thompson in Perthshire and Inverness-shire. Writing in 1841[2] and 1847[3] De Selys-Longchamps made the suggestion that *M. agrestis* and *M. neglectus* might be only local races of the same species, but preferred to regard the two as distinct until their characters could be further studied. He stated that *M. agrestis* was to be found in Sweden and Norway, from Scania to 66 degrees of north latitude, but not in the high mountains; and that it was also reported from Denmark and Finland. *M. neglectus*, on the other hand, had a more southern distribution, embracing England, Scotland, Belgium, France north of the Seine and west of the Moselle, and possibly the Pyrenees. In 1856 Dehne reported it from Saxony; but subsequent writers, including Blasius[4], Fatio[5], and Bell[6], have regarded it as a variety of *M. agrestis*, although the latter recognized the difference between the two forms, for however distinct the extreme forms of

[1] Ann. of Nat. Hist. vol. vii. pp. 270–274 (1841).

[2] Bull. Acad. Sci. Bruxelles, Sept. 1841. In this paper the differences between *M. agrestis* and *M. arvalis*, formerly confused, appear to have been first clearly pointed out.

[3] Revue Zoologique, Oct. 1847, pp. 305–312.

[4] Säugethiere Deutschlands, pp. 369 & 372 (1857).

[5] Les Campagnols du Bassin du Léman, p. 70 (1867).

[6] British Quadrupeds, ed. 2, p. 326 (1874).

Microtus agrestis (typical).

No. in my Collection.	Date.	Sex.	Dimensions in mm.			Collector.	Locality.
			Head and body.	Tail.	Hind foot.		
No. 74.....	27/7/95	♂	153	25	20	[1] J. Lewis Bonhote.	Jerkin, Norway.
75.....	28/7/95	♂	160	35	20	,,	,,
76.....	29/7/95	♀	165	40	20	,,	,,
79.....	29/7/95	♀	101	23	16	N. F. Ticehurst.	Brekkebydgden, Norway, 2700 feet.
80.....	29/7/95	♂	113	28	15	,,	,, ,,
In Brit. Mus. Coll. —.....	4/9/95	♂	132	31	19	Gustav Kolthoff.	Jemtland, Medslægon.
—.....	11/9/95	♀	124	36	16	,,	,,
—.....	5/9/95	♀ (suckling young).	123	37	17	,,	,,
—.....	4/9/95	♀ (suckling young).	131	39	17	,,	,,
—.....	11/9/95	♀	124	35	17	,,	,,

[1] Mr. Bonhote's measurements appear to be excessive, but there is no doubt that the animals were very large ones, both from the appearance of the skins and also (a much safer test) of the skulls: Mr. Bonhote's measurements might be reduced a great deal before they would be equalled by even the largest of my British specimens, no. 47. The smaller specimens are not fully grown.

Microtus agrestis neglectus.

No. in my Collection.	Date.	Sex.	Dimensions in mm.			Collector.	Locality.
			Head and body.	Tail.	Hind foot.		
No. 47 ...	31/5/94	♂	123	33	17	J. A. Coward.	Longendale, East Cheshire.
*W. 86 ...	29/6/94	♂	120	33	18	W. E. de Winton.	Graftonbury, Herefordshire.
No. 46 ...	19/6/94	♂	118	33	17	J. A. Coward.	Cheshire.
*W. 83 ...	26/6/94	♂	114	32	16·5	W. E. de Winton.	Herefordshire.
(5) *W. 85 ...	28/6/94	♀	112	33	15	,,	,,
*W. 33 ...	12/5/94	♂	112	32	16	,,	,,
65 ...	19/5/95	♀	112	28	15	G. H. Caton Haigh.	Lincolnshire.
67 ...	30/8/95	♂	112	27	14	,,	,,
95 ...	14/1/96	♂	108	30	18	,,	,,
135 ...	20/2/96	♀	108	22	16	,,	,,
94. 6. 6. 18 ... (Brit. Mus. Coll.)	20/5/95	♂	103	34	17	Oldfield Thomas.	Guines, Pas de Calais.
93 ...	27/12/95	♂	90	23	17	G. E. H. B.-H.	Dinan, Brittany.

The following measurements will show the difference in size between two skulls of the Northern form and two of the largest British specimens which I could lay hands on :—

	M. agrestis.		*M. agrestis neglectus.*	
	No. 74.	No. 75.	*No. W. 86.	No. 47.
Greatest length of skull in millimetres	27·5	27·5	25	24
Greatest breadth (at zygoma)	17	17	16	15

* The specimens marked thus were kindly lent to me by Mr. W. E. de Winton and are the largest in his collection.

M. agrestis and *M. neglectus* may be, there can hardly fail to exist, in countries on the boundary-line of their respective ranges, intermediates whose presence would render it impossible to regard the two as distinct species. No doubt this was the right course to take so long as there was only open to naturalists the binomial system of nomenclature. It seems to me, however, that there is here a good case for the use of the trinomial system, especially as it can be done without inventing any new name.

The Voles constitute so difficult a genus that it is not surprising that the distinguishing characters laid down by even such good naturalists as Jenyns and De Selys-Longchamps are not very clear, especially as they appear to have been given partially with a view to distinguish *M. neglectus* from the Continental species *M. arvalis*, which was at that time supposed to occur in Great Britain, or to be represented there by a supposed nearly allied species *M. britannicus*; while, to further add to the confusion of ideas, the differences between *M. agrestis* and *M. arvalis* were very imperfectly recognized, if at all. I think, however, that De Selys-Longchamps's remarks show that he applied the name of *neglectus* to one of the forms to which this paper refers: hence, if it be considered desirable, as I submit it is, to distinguish these two distinct forms by different names, the British and Southern form should, I think, be distinguished as *M. agrestis neglectus*, Jenyns, while the name of *M. agrestis* (Linn.) should be restricted to the more Northern form.

The following are the characters of the two forms or subspecies:—

MICROTUS AGRESTIS (Linn.).

This is a large Vole reaching when adult a length (head and body) of 130 millimetres and upwards. It differs in coloration from the Southern form, the upperside wanting the reddish tinge of British specimens, and the underside being of a purer white colour, most British examples having the underside washed with yellow. The skulls of the Northern form are much larger and stronger than those of the Southern, and the postorbital and other crests are more prominent. The whole skull is very Lemming-like in appearance, being much flattened and having the zygomatic arch very deep.

Mr. Bonhote informs me that the Norway Voles were very Lemming-like in appearance when alive and he found them inhabiting the same burrows as Lemmings.

MICROTUS AGRESTIS NEGLECTUS, Jenyns.

This is a smaller animal, not averaging more than about 110 millims. when fully grown. It may be distinguished by the characters given above, viz., the size, cranial characters, and coloration. There is usually a reddish tinge on the upper surface of the adults and a yellowish wash to the belly, especially in summer, which, when present, is very distinctive.

Distribution.—These two subspecies seem to be distributed, roughly speaking, in the manner stated by De Selys-Longchamps in 1847, in fact it would be impossible to add to or correct what he has said on this point without examining more specimens than are at present available. The fact that the two French specimens which I have been able to examine are of the *neglectus* form is very interesting and confirms De Selys-Longchamps's statements. There are no German specimens in the British Museum collection, but Dehne[1] has stated that *M. agrestis neglectus* occurs fairly commonly in Saxony, near Penig and Lössnitz, while Fatio found it in the Hasli Thal, in Switzerland.

To show the differences in size between the two races, I give the dimensions (see pp. 600, 601).

The measurements are taken from the ten largest British specimens I could lay hands upon, and I have added to them those of the only two French specimens which were available.

In all cases, except those of Mr. Bonhote's specimens, the measurements of the tails were taken so as not to include the last hairs. The specimens kindly collected for me by Messrs. Coward and Caton Haigh were measured by Mr. F. Metcalfe of Cambridge; the dimensions of the remainder were taken by the collectors. It will be seen that the length of an average British specimen runs to about 106 millimetres, while anything above that must be regarded as large. The two largest British specimens I have been able to examine are my own no. 47, sent me by Mr. Coward from Cheshire, and Mr. de Winton's no. W. 86 from Herefordshire. These two somewhat approach the younger Norway specimens in size and characters, and these are the only two that do so out of numerous specimens examined.

3. Contributions to the Anatomy of Picarian Birds.—Part III. On some Points in the Anatomy of the Kingfishers. By Frank E. Beddard, M.A., F.R.S., Prosector to the Society.

[Received May 18, 1896.]

The family Alcedinidæ shows more structural variation within its own limits than any other family of Picarian Birds.

The first to call attention to this was Prof. Garrod, who remarked in describing[2] the tensores patagii of various Passerine and Picarian Birds—"In the Alcedinidæ the differences are so considerable in the several genera that I reserve the description of the muscle in this order for a future occasion." Again, in referring to the course of the leg-veins he pointed out the abnormal con-

[1] A. Dehne in 'Allgemeine deutsche naturhistorische Zeitung,' new series, vol. ii. pp. 212 and 223 (1856).

[2] "On some Anatomical Peculiarities which bear upon the Major Divisions of the Passerine Birds.—Pt. I.," P. Z. S. 1877, p. 512.

ditions obtaining in *Dacelo*[1]. Prof. Garrod never carried out the intention expressed in the above quotation. I propose in the present paper to supply this deficiency and to bring before the Society other facts in the anatomy of the group.

Pterylosis.

The Kingfishers have for the most part a tufted oil-gland. But I find that in *Cittura cyanotis* and *C. sanghirensis* the oil-gland is distinctly nude, and I have a note by Mr. Forbes to the effect that that is also the case with three species of *Tanysiptera*. In the latter genus, moreover, there are only *ten* rectrices; in other Kingfishers (including *Cittura*) *twelve*.

According to Dr. Gadow's table[2], the Alcedinidæ and Cypselidæ are the only families of Picarian birds in which the 5th cubital remex may be either absent or present.

Dacelo, *Ceryle*, and *Sauropatis* are aquintocubital; *Cittura*, *Alcedo*, and *Halcyon* are quintocubital.

The feather-tracts of a few species have been examined by Nitzsch. I have studied those of a few others. In the majority of Kingfishers the ventral tract branches in the pectoral region on each side into a stronger outer and a weaker inner branch, the latter being continuous as far as the cloaca. Nitzsch remarks of "*A. collaris*" (=*Sauropatis chloris*) that it is "strikingly distinguished by having the outer branch of the inferior tract very near the main stem." I find that a broad pectoral tract, barely, if at all, distinguishable into two branches, characterizes the following species of *Sauropatis*, viz.: *S. sordidus*, *S. vagans*, and *S. chloris*; it is very possibly a mark of the genus.

In this genus, as in *Dacelo* (figured by Nitzsch), in *Halcyon* and in *Cittura* there is a very long gap sparsely feathered which lies between the anterior and posterior closely feathered parts of the spinal tract. In *Alcedo ispida*, on the other hand, the trunk part of the spinal tract is closely feathered throughout. I find in *Ceryle americana* an intermediate condition, the dorsal gap being but slightly marked.

It will be observed that these various divergences in the arrangement of the pterylæ correspond in every case to a missing 5th remex.

Tendons of the Wing.

The tendons of the tensor patagii brevis show three modifications among the Kingfishers, which are shown in the accompanying drawings (figs. 1–3) by the late Mr. W. A. Forbes.

In *Alcedo ispida*, Fürbringer (Unters. z. Morph. u. Syst. Vögel, Taf. xxiii. fig. 17), we have the simplest conditions. The tendon in question is perfectly simple, without branch or complication of any kind. *Alcyone lessoni* is precisely the same.

[1] *Ibid.* p. 516.

[2] "Aves" in Bronn's 'Thier-Reich,' Syst. Theil, p. 82.

In *Halcyon rufa* (fig. 1), *H.* sp., *Ceryle alcyon* (fig. 2), and *C. americana* there is only a single tendon, but it gives off a forwardly running wristward slip. The main tendon, as in *Alcedo*, is continued over the muscles of the forearm to the ulnar side. In *Ceryle* (fig. 2) there is this difference, that the main tendon is very wide and diffused. *Sauropatis sordidus* (somewhat unexpectedly) agrees with *Halcyon* in its single tendons.

Fig. 1. Fig. 2. Fig. 3.

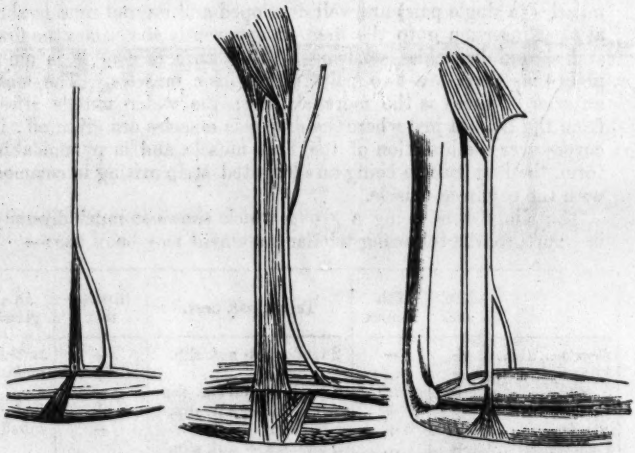


Fig 1.—*Halcyon rufa*. Tendons of tensor patagii brevis.
Fig. 2.—*Ceryle alcyon*. Tendons of tensor patagii brevis.
Fig. 3.—*Sauropatis albicilla*. Tendons of tensor patagii brevis.

In *Dacelo*, *Sauromarptis*, *Pelaryopsis*, *Sauropatis* (fig. 3) (*sanctus*, *albicilla*, *vagans*, *chloris*), *Cittura* (*sanghirensis*, *cyanotis*), and *Tanysiptera* the tendons are more complicated. There are two separate tensor patagii brevis tendons which often converge, and very nearly if not quite meet at their insertion onto the forearm; the anterior of these, which is alone continued onto the ulnar side of the arm, has a wristward slip.

Syma agrees with these genera in having two parallel tendons, but differs from them in having no wristward slip.

To another myological peculiarity of some Kingfishers attention was first called by Dr. R. O. Cunningham. He pointed out the existence in *Ceryle stellata* of a tendinous link uniting the two *biventres cervicis* muscles, and the absence of this link in *Alcedo*. I have examined the genera mentioned in the table at the end of this paper (p. 606), with the exception of *Syma* and *Tanysiptera* (upon which I have a note by Prof. Garrod), and find that there are quite as many genera which have this tendinous link as there

are which have it not. The *expansor secundariorum* is another muscle which is sometimes absent and sometimes present.

In marked contrast to the muscular anatomy (excepting the leg-muscles, of which the formula seems to be always AX—), and to the external characters, is the syrinx. I have examined this organ in *Alcedo*, *Dacelo*, *Cittura*, *Ceryle*, *Halcyon*, and *Sauropatis*, and find it to be most uniform in structure. In all it is of the typical tracheo-bronchial form, without a complete coalescence of the last rings of the trachea, except sometimes in front. The intrinsic muscles (a single pair) are well developed and fan out considerably at their insertion onto the first, or apparently sometimes the first and second bronchial semirings. In *Dacelo cervina* it is quite plain that there are two pairs of intrinsic muscles. The most anterior of these is the more slender; the wider muscle arises from the trachea just where the extrinsic muscles are given off; it covers over the insertion of the first muscle and is pyramidal in form, the first muscle being an elongated strip arising in common with the extrinsic muscle.

The Kingfishers being a group which shows so much diversity in structure, the following tabular statement may be of use:—

	Exp. sec.	5th Remex.	Tensor pat. brev.	Biventer link.	Oil-gland.
Dacelo	+	−	2 tendons + ant. slip.	−	tufted.
Tanysiptera	+	...	„ „	+	nude.
Syma	+	...	2 tendons; no ant. slip.	−	
Cittura	+	+	2 tendons + ant. slip.	+	nude.
Alcedo	0	+	1 tendon.	−	tufted.
Pelargopsis	+	...	2 tendons + ant. slip.		
Todirhamphus	+	...	„ „		
Alcyone	...	...	1 tendon.		
Ceryle	+	−	1 tendon + ant. slip.	+	tufted.
Halcyon	+	+	„ „	−	tufted.
Sauropatis	−	−	2 tendons + ant. slip.	−[1]	tufted.
Sauromarptis	...	...	„ „		

[1] + in one of two specimens of *S. vagans*.

The above table not only displays the variation in structure of the family but shows the impossibility of a subdivision of the family, at least without further facts—for it is unnecessary to point out specially the lacunæ in the above table.

Halcyon is perhaps to be regarded as the simplest form, while *Dacelo* and *Sauropatis* are at the opposite extreme. The necessary separation of *Sauropatis* and *Halcyon* is the classificatory fact upon which I would lay the greatest stress. It may be that the black-billed species will turn out to be *Sauropatis*, and the red-billed the true *Halcyon*.

I would also point out the somewhat disappointing fact that no particular results seem to be obtainable from a comparison of the quintocubital with the aquintocubital genera.

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LOPHUROMYS ANSORGEI.

4. On a new Rodent of the Genus *Lophuromys* from British East Africa. By W. E. de Winton, F.Z.S.

[Received May 15, 1896.]

(Plate XXVII.)

In a small series of mammals presented to the National Collection by Dr. W. J. Ansorge, Medical Officer to Her Majesty's Government in Uganda, who is now home on leave, I find two specimens of a very handsome mouse of the genus *Lophuromys* new to science, which I propose to name in honour of the collector.

Lophuromys ansorgei, sp. n. (Plate XXVII.)

The whole of the upper parts of the head and body smooth dark chocolate colour, with no markings whatever; the underparts uniform pale cinnamon; the feet dark above and below; the tail black-brown, slightly greyer beneath, especially basally, rather short and thick, covered with hair, but not densely enough to conceal the scales; ears moderate, rounded, covered with close short hairs.

On parting the fur of the upper parts it will be found that the tips only of the hairs are dark, shading gradually into bright tan at the bases; there is no underfur; all the hairs are perfectly straight, of a uniform length and of very much the consistency of a stiff camel's-hair brush.

Measurements taken from dried skin:—Head and body 135 mm.; tail 49 mm.; pes 22 mm.; forearm and hand 33 mm.

Skull: greatest length 33·5 mm., greatest breadth 17 mm.; basifacial length 20 mm.; basicranial length 10 mm.; incisive foramina—length 6·5 mm., breadth 2·8 mm.; nasals—length 15 mm., breadth 3·5 mm.; upper molar series 5·5 mm.; lower molar series 5 mm.; mandibles, from condyle to incisor tips, 24 mm.

Hab. Mumia's, Kavirondo, N.E. of Lake Victoria.

Type no. 96. V. 8. 1, in Brit. Mus.

The nearest ally of this species is most likely *L. sikapusi* from West Africa, but it is easily distinguished by its rather larger size and much darker and handsomer colouring.

Seen through a lens, each hair is flattened like a blade of grass, tapering abruptly to a sharp point at either end; some of the hairs are flat, others have the edges turned over so that the cross section forms the segment of a circle. The claws are long and straight: these and the hairy nose and other peculiarities of the genus are well described by Mr. F. W. True (Proc. Nat. Mus. Washington, 1892, vol. xv. p. 460), in his description of *Mus aquilus*, which no doubt should be referred to this genus. I should like also to suggest that Mr. True's name should be altered to *aquilæ*, as it was derived from the fact of the specimen having been killed by a bird of the eagle tribe. I may mention that there is in the British Museum a specimen which seems to agree with the

description of *Mus aquilus*: this is a smaller animal, freckled with light tips to the hairs, and is otherwise very distinct from the animal now under notice, but shows that Mr. True's specimen was about full-grown, and that the tail was not materially shortened by the injury mentioned.

Dr. Ansorge has been hitherto known in connection with zoology as a collector of insects, but he gives me an interesting account of the accident which put him in possession of this collection of mammals. The site of a long disused village had been purchased for the purpose of building the new Government Medical Hospital, and in clearing the long grass and scrub in the usual manner of surrounding it and burning towards the centre, as the circle narrowed it was discovered that there were a large number of small mammals enclosed. It being observed that there were "rats of all colours," a selection of pairs of different sorts was made, with the result that some ten or a dozen specimens were obtained. Dr. Ansorge describes the *Rhizomys* heaving up the ground like giant moles; many of the new *Lophuromys*, quite twenty, were left on the ground.

The two specimens agree in every particular and are said to be male and female, but are not labelled.

The other species represented in the collection are *Rhizomys splendens*, Rüpp., *Gerbillus afer*, Gray, *Mus* (*Isomys*) *abyssinicus*, Rüpp., and *Mus* (*Leggada*) *minutoides*, Peters.

June 2, 1896.

F. DuCane Godman, Esq., F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of May:—

The registered additions to the Society's Menagerie during the month of May were 154 in number. Of these 52 were acquired by presentation, 62 by purchase, 14 by exchange, 4 were born in the Gardens, and 22 were received on deposit. The total number of departures during the same period, by death and removals, was 86.

Amongst the additions the following are worthy of special notice:—

1. A Red-naped Fruit-Bat (*Pteropus funereus*), purchased May 1st. This Australian animal is new to the Society's list.

2. Four examples of a Tortoise belonging to the group of Gigantic Tortoises, deposited by the Hon. Walter Rothschild, F.Z.S., May 26th. These Tortoises are believed to be referable to Daudin's Tortoise (*Testudo daudini*), from the Aldabra Islands, which is a species peculiar for the form of its carapace, the two anterior and the two posterior marginal plates being strongly reverted (see Günther, 'Gigantic Land-Tortoises,' p. 33, pl. 5).

3. Two Rüppell's Vultures (*Gyps rueppelli*), received in exchange May 28th, from the Zoological Gardens, Cairo. These fine birds, which I saw at Cairo when there last year (see P. Z. S. 1895, p. 400), are said to have been obtained in the Western Desert of Egypt, and are of much interest, as the species has not been previously noticed within the confines of Egypt proper. The authorities of the Gizeh Gardens have kindly parted with them in our favour.

Mr. Sclater exhibited the skin of a species of *Cercopithecus* which had been received, living, by the Society on the 20th September 1895, and had died in the Menagerie on the 23rd of April last, and a water-colour drawing of the same animal by Smit. Mr. Sclater had been uncertain as to the correct determination of this specimen (which had been obtained by Mr. John M. W. Pigott, when Acting-Administrator for the I. B. E. A. Company at Mombasa, East Africa, from a native who had caught it) in its lifetime, but now believed that it must be referable to his *Cercopithecus stairsi* (P. Z. S. 1892, p. 580, pl. xl.), as shown by comparison with one of the typical specimens. The present specimen, which was a female, agreed in nearly every respect with the male presented by Mr. F. Hintze, June 7, 1893 (see P. Z. S. 1893, p. 612), except in being of smaller size, which was of course attributable to its sex, and in having the bright rufous spot on the temples not so clearly marked although plainly visible. The short erect hairs on the front of the forehead were also more stained with rufous than in the male specimen.

Mr. Sclater remarked that this distinct species of *Cercopithecus* had now been received from three different spots on the East Coast of Africa—Chindi at the mouth of the Zambesi, Mozambique, and British East Africa.

Mr. Sclater exhibited a series of 12 water-colour drawings of African Antelopes, taken partly from specimens in the Natural History Museum and partly from examples living in the Society's Gardens, executed by Mr. Edmund Caldwell, of 41 Clifton Gardens, Maida Vale.

A communication was read from Mr. Henry J. Elwes, F.Z.S., and Mr. Edwards, containing a revision of the European and Asiatic Butterflies of the Family Hesperiidæ. The species treated of in this paper were about 450 in number and were divided into about 100 genera.

This paper will be printed in the Society's 'Transactions.'

The following papers were read:—

1. Explanation of the Plan adopted for preparing an "Index Generum et Specierum Animalium." By C. DAVIES SHERBORN, F.Z.S.

[Received June 2, 1896.]

The following description of the work of preparing an Index to the generic and specific names of animals, both recent and fossil, which was commenced by the author in July 1890, has been prepared for the Society, at the request of Sir William Flower, Mr. Sclater, and Dr. Henry Woodward:—

The difficulty of finding accurate and reliable lists of the species of any particular genus was pointed out by Darwin years ago, and impressed itself so strongly on that naturalist that he personally endowed the undertaking which we know as the 'Index Kewensis,' recently brought to so successful a conclusion by Benjamin Daydon Jackson. In this book of reference there are some 600,000 generic and specific names of flowering plants. The botanist has now a key to the literature of Phanerogams for 150 years within covers, and all difficulty in keeping pace with present and future descriptions of new phanerogamic plants has been removed.

It is quite otherwise with zoological generic and specific names. Agassiz, Marschall, Scudder, and others have partially catalogued the genera; Waterhouse has listed the genera of birds; H. G. Bronn, John Morris, and, more recently, R. Etheridge have provided lists of fossil species. But no one book including references to all names that have been given to fossil and recent animals has yet been attempted. The vastness of the record is appalling, but given time all difficulties disappear.

The work now commenced by the German Zoological Society, which was described before this Society at a recent meeting, and known as 'Das Tierreich,' will be familiar to all present; and it has been suggested that a brief account of the 'Index Generum et Specierum Animalium' should be put on record in the same manner.

In May 1890 a letter appeared in 'Nature' and in 'La Feuille des Jeunes Naturalistes,' from the author, setting forth a scheme for the compilation of such a work, and inviting suggestions for improved details or other matter. Beyond friends interested at the British Museum, those who offered valuable suggestions were David Sharp, Alfred Newton, Sven Lovén, and Victor Carus. It was therefore obvious that the details were satisfactory to those interested, and work was commenced on July 1st, 1890.

Since that date recording has steadily progressed (circumstances have restricted the time at disposal to an amount equivalent to three years) and a total of 130,000 slips have been stored away in the alphabetical order of genera. Notices of the progress of the work have appeared in 'Nature,' vol. xliv. p. 207 (1891), and 'Natural Science,' vol. iii. p. 379 (1893), and the manuscript has been

frequently referred to by those in need of information at the British Museum and elsewhere.

The following is a reprint of the original set of rules:—

(1) The earliest reference is to date from the twelfth edition of Linnæus, 1766.

(2) The last reference to close with December 31, 1899.

(3) The names of genera and species to be given in one alphabetical sequence, and accompanied by a reference to the original source.

(4) The names of species of each genus to be also quoted in alphabetical order under that genus.

(5) No attempt at synonymy to be given; but, to assist reference, the various genera in which a species has from time to time been placed to be indicated under that species.

(6) Pre-Linnæan names to be quoted as founded by the author first using them after 1766:—e. g., *Echinocorys*, Leske, 1778 (*ex* Klein, 1734). Should a pre-Linnæan species or genus have been re-named after 1766, before the post-Linnæan use of that pre-Linnæan name, the new name is to stand. [References will be given to Artedi, Brisson, and Scopoli, in accordance with British Association rules.]

As soon as the work commenced it was found advisable to adopt the 10th edition of the 'Systema' as a starting point, instead of the 12th. The reasons for this adoption need not be discussed here; the use of the 10th edition is fast becoming universal. This alteration caused a slight modification of several of the proposed rules. At the same time a reference is also given to the 12th edition of the 'Systema,' as it will be convenient to many people and will not increase the number of slips in any appreciable degree.

Each genus name and each species name is recorded on a separate slip, the original reference being quoted; and every time a species name is transferred to a new genus a separate slip is used, the quotation including a reference back to the original genus in which the species was first placed.

Each slip is made out in duplicate: one set being sorted up in alphabetical order of genera; and a second set being kept tied up as an index of the contents of the particular book quoted.

References are taken from one book at a time—*i. e.* a book is gone through from cover to cover—every genus and species, and every change of genus, being systematically recorded; thus completely disposing of that particular book, and ensuring the almost absolute certainty of every reference being taken. This system proves far more exact than the recording of any special group of animals at one time. It further permits of the printing from type of a reference to that particular book on each slip, and thus ensures the absolute accuracy of the reference with the sole exception of the page. The entries are made in black-lead pencil and black or blue carbon paper—both methods having proved to be quite indelible.

A particular paper has been chosen, known as "white rope," which presents the requisite stiffness for an edge-on arrangement

of slips, the toughness necessary for constant handling, a surface equally convenient for pencil and carbon paper, and a cheapness of 1*s.* 2*d.* per 1000 slips. The size of slip employed is 127 × 63 mm. (5 × 2½ inches).

Nomina nuda are distinguished by the letters [*n. n.*].

Nomina nuda accompanied by figures by the letters [*n. et f.*].

In those cases where an author has described and figured a species some time after printing his *nomen nudum*, a reference is also given to the *nomen nudum*, when possible.

Particular attention has been paid to the date of publication of books, periodicals, and serials. This is a part of the work which demands considerable time and patience, but the results obtained fully justify the labour. The more important results as to dates already arrived at and published are:—

Pallas, P. S., Icones Insect. (See Annals Mag. ser. 6, vii. p. 236, 1891.)

Pallas, P. S., Nov. spec. Glir. (See Annals Mag. ser. 6, vii. p. 236, 1891.)

Schreber, J. C. D., Säugthiere. (See Proc. Zool. Soc. 1891, p. 587.)

Sowerby, Genera Recent Shells. (See Annals Mag. ser. 6, xiii. p. 370, 1894.)

Encyclopédie Méthodique. (See Proc. Zool. Soc. 1893, p. 582.)

Jardine and Selby, Illustr. Ornith. (See Ibis, 1894, p. 326.)

Moore, F., Lepidopt. Indica. (See Annals Mag. ser. 6, xi. 1893, p. 260, and ser. 6, xiv. 1894, p. 464.)

Siebold, P. F. von., Fauna Japonica. (See Proc. Zool. Soc. 1895, p. 149.)

The date of publication of a species is taken to be that date on which the print in which the name appears is offered for public sale or public distribution.

No author's copy, and no excerpt from any publication distributed privately before such publication is offered for public sale or public distribution, has been accepted.

In the case of privately printed books, entries taken from them are distinguished by the words [*auct. typ.*].

In all cases where the date is doubtful and cannot be definitely ascertained, the date figures are enclosed in brackets [ ], or have some other distinguishing mark—*e. g.*, ?—placed against them.

In the case of plates appearing before the text, the date of each is given if ascertainable (*e. g.*, Schreber's 'Säugthiere'), but in no case is the date of a plate accepted in preference to the date of text, for the reasons which follow:—

The figure depicted on a plate may, or may not, be the drawing intended by the author; it is the work of the artist, who is also responsible for the descriptive legend. In numerous instances the descriptive legend on a plate is quite erroneous, and has been repudiated by the author in his text. Until the text descriptive of a plate appears, the names on the plate must be considered as *nomina nuda*, and it is open to anyone to describe and rename such *nomina nuda*.

Species "indett.," if figured, are included in the index.

Misprints are quoted only if considered liable to cause confusion.

The following is an example of the Index as proposed to be carried out. The inclusion of an alphabetical list of species under each genus name is a matter for consideration, if ever the MS. comes to the printing office. It can be adopted or rejected at option, and if adopted the duplicate set of slips will be available for the purpose.

In arranging the Index for printing it is proposed to print one alphabetical list from beginning to end; the species names and the genus names falling into one order according to the arrangement of their spelling. The following are the reasons for arranging the work under species and not under genera, as in the 'Index Kewensis':—

1. No synonymy of species is attempted: that depends on the idiosyncrasy of the systematist.
2. Any attempt at specific synonymy would be fatal to progress, as experience shows that vast changes may take place in a single year.
3. An arrangement under species permits of a generic synonymy, for by running the eye down the second column of the printed work, it will be possible to ascertain the various generic names with which a particular species name has been connected.

Acervulina, *M. Schultze, Org. Polyth.* 67. Rh. 1854.
[acinosa; cretæ; globulosa; inhærens.]
acinosa Acervulina, *M. Schultze, Org. Polyth.* 1854, 67.
acuta Alveolina, *Savi & Meneghini, Cons. geol. Tosc.* 1851, 206.
Alveolina, *A. D. d'Orbigny, Ann. Sci. Nat.* vii. 306. Rh. 1826.
[acuta; boscii; bulloides; compressa; costulata; cylindrica; decipiens; depressa; ellipsoidalis; elliptica; elongata; eximia; fortisii; etc.]
Archiacina, *Munier-Chalmas, B. S. géol. Fr.* [3] vii. 445. Rh. 1879.
[armorica; munieri.]
armorica Archiacina (d'Arch.), *Munier-Chalmas, B. S. géol. Fr.* [3] vii. 1879, 445. [Cyclolina.]
—— Cyclolina, *d'Archiac, B. S. géol. Fr.* [2] xxv. 1868, 376.
Cyclolina, *A. D. d'Orbigny, Foram. Vien.* 139. Rh. 1846.
[armorica; carinata; cretacea; dufrenoyi; impressa; pedunculata; prælta.]

The group and date of the genus are shown by the "Rh. 1854"=RHIZOPODA, 1854.

From this description of the 'Index Generum et Specierum Animalium,' it will be seen that a manuscript comprising 130,000 references is already in existence and is available for daily reference.

Sir Wm. Flower, Dr. Güuther, and Dr. Woodward took so much interest in the original scheme that they at once offered the necessary space and cabinets for the storage of the manuscript at the British Museum (Natural History)—an offer of considerable value, as it not only renders the MS. easily accessible to those wishing to consult it, but ensures safety from fire and other destructive agencies. The General Committee of the British Association

have been generous enough to assist the work by a donation of £70. This has been of considerable assistance in the purchase of paper, material, &c.

A manuscript of this nature is necessarily imperfect for any one genus until the whole literature has been gone through. As far as possible it is compiled from 1758 upwards, but often a side issue takes the compiler on even into the present year. Every book when completed is ticked off in some well-known Catalogue, and a catalogue slip is made, so as to allow of an alphabetical register.

It is believed that the plan adopted for preparing an 'Index Generum et Specierum Animalium' is so arranged and so carried out that the work is completed day by day so far as it goes, and that it would be easy for any individual to continue the carrying out of the scheme to-morrow should there be occasion to do so.

2. Remarks on the Dentition of Snakes and on the Evolution of the Poison-fangs. By G. A. Boulenger, F.R.S.

[Received May 26, 1896.]

By the researches of Mr. G. S. West on the buccal glands of Snakes, the results of which appeared in the last volume of these 'Proceedings' (1895, p. 812), a further blow has been dealt to the taxonomic division of Snakes into poisonous and non-poisonous, a division I may claim to have been the first to abandon[1].

Certain statements in the above-mentioned paper, concerning the dentition, call for criticism. In the Introduction to the first volume of the 'Catalogue of Snakes,' it was pointed out that the indication of the number of teeth should refer to the full set in each maxillary, as "few specimens show the complete dentition, gaps occurring here and there, but shallow sockets in the bone indicate the bases of the missing teeth." This has not been taken into consideration by Mr. West, who erroneously ascribes diastemata between the solid teeth to *Leptodira*, these being simply due to loss of teeth in the specimen examined by him; the maxillary teeth form an uninterrupted series in that genus. Besides, it will be seen, by comparing his statements and figures with the indications in the 'Catalogue of Snakes,' that, in most cases, the number of teeth given by him is lower than the actual full set. The error I point out is an important one, since, were the teeth counted in that manner, hardly any two specimens of the same species would show the same number. It even often happens that every alternate tooth having dropped out, the jaw appears, on a superficial exami-

[1] My views have been accepted by Prof. Cope, who, in his latest classification (Tr. Amer. Philos. Soc. xviii. 1895, p. 186), observes: "One result is that I am able to confirm the conclusion of Boulenger, *i. e.* that the Colubriform venomous Snakes, the Proteroglypha, do not differ in any fundamental respect from the non-venomous Colubridæ." Dr. Günther (Biol. C.-Am., Rept. 1895), on the other hand, still adheres to the old arrangement, as evinced by his continuing to intercalate the Boidæ, the most generalized of all Ophidians, between the Opisthoglypha and the Proteroglypha.

nation, to possess only half the real number. As early as 1856, the late Dr. J. G. Fischer (Verh. Naturw. Hamb. iii. p. 23) warned observers against such a fallacy. With a little experience, it is easy enough to ascertain whether teeth are accidentally missing or whether true diastemata are present.

The author further mentions that the grooved teeth in the Opisthoglyphs vary in number from one to three. It should have been added that examples of as many as five grooved teeth occur in the genus *Oxybelis*.

With regard to the Proteroglyphs, it is a matter for regret that Mr. West should not have had an opportunity of examining specimens with all the maxillary and some of the mandibular teeth grooved, such as we find in the genus *Distira*. The presence of grooves on the posterior "solid" teeth was first pointed out by Thomas Smith (Phil. Trans. cviii. 1818, p. 472), and later by J. G. Fischer (*l. c.* p. 21). In 1890 (P. Z. S. p. 618) I recorded the presence of grooves on the mandibular teeth in a specimen of *Distira*, and I have since found them in another genus of Hydrophines, *Aipysurus* (Cat. iii. p. 303) and in an Elapine, *Glyphodon* (*t. c.* p. 313). It would have been highly interesting to ascertain whether any connection exists between the poison-gland and the small grooved maxillary teeth, and whether any correlative modification of the sublabial glands obtains in those forms in which the mandibular teeth show grooves.

I have previously expressed the opinion that the Viperine maxillary may be regarded as derived from the Opisthoglyph. In order to trace the probable evolution of the maxillary in Snakes, it suffices to survey the multitudinous modifications offered by the existing forms, for although possibly not one of them represents the actual groups through which evolution has taken place, they show clearly enough the various steps connecting the extreme types and the probable derivation of one type from the other.

In the first place, the hypothetical primitive Ophidian dentition is exhibited by *Xenopeltis* (Cat. i. p. 168), in which the maxillary, præmaxillary, and dentary are armed with very numerous, closely set, equal solid teeth. Next we have *Polyodontophis* (*t. c.* p. 181), which only differs in the absence of teeth on the præmaxillary bone. From this type numerous and gradual modifications arise through reduction in the number of teeth and irregularity in their size, leading to *Boodon* (*t. c.* p. 327) among the forms with persistent hypapophyses throughout the vertebral column, in which some of the anterior teeth, situated near the palatine process of the maxillary, become enlarged and fang-like, although still devoid of grooves. From such a type we may reasonably assume the Elapines, which still retain the hypapophyses, to have been derived through abbreviation and suppression of the portion of the maxillary anterior to the palatine process concurrently with the development of grooves in the anterior fangs. In the series now reached, the Elapinæ (Cat. iii. p. 310), the groove becomes deeper and deeper, the margins of the tooth ultimately coalescing to form the

"perforated" fang of *Elaps* proper (*t. c.* p. 411), in which all other maxillary teeth have disappeared and the palatal and mandibular teeth are much reduced in number. In other genera of the same group the posterior maxillary teeth persist and may all acquire feeble grooves, as well as the anterior mandibular teeth (*Glyphodon*, p. 313). In the Proteroglyphs adapted to life in the sea, a similar series of modifications takes place. From the Aglyphodont forms, in which the teeth increase in size posteriorly, we are gradually led to the Opisthoglyphs, which are only to be distinguished by the presence of more or less deep grooves on the posterior fang-like teeth, the series culminating in such forms as have the maxillary bone much abbreviated, the solid teeth reduced to two or three, and the fangs extremely large and deeply grooved (*Miodon*, *t. c.* p. 250). If we then turn to the skull of the least specialized among the Viperidæ (*Causus*, *t. c.* p. 466) we see that the poison-fangs are situated on the posterior extremity of the maxillary, close to its articulation with the ectopterygoid, a condition which is identical with that of the Opisthoglyphous Colubrids. It is therefore clear to me that the Viperids have been derived from the Opisthoglyphs, and that there is no direct genetic relationship between them and the Proteroglyphs, contrary to the old view which represented the Elapines as forming the passage between the Colubrines and the Viperines. We have thus traced a nearly complete filiation, so far as the jaws and teeth are concerned, between the Colubridæ aglyphæ and the proteroglyphæ on the one hand, and between the former and the Viperidæ on the other.

Mr. West points to structural differences in the poison-glands between the Opisthoglypha and the Proteroglypha. It will be a matter for future investigation to ascertain whether he is justified in his assumption that the gland is homologous in these types or whether it has not been independently developed.

June 16, 1896.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

Mr. Sclater exhibited a drawing (Plate XXVIII.) of the Gnu of Nyasaland, taken by Mr. Caldwell from the specimen recently transmitted to him by Sir H. H. Johnston (see above p. 506), and now placed in the British Museum. Mr. Sclater pointed out the differences between this form and the ordinary form of the Brindled Gnu (to which the specimens now living in the Society's Gardens belonged), which consisted mainly in the generally brownish colour of the fur and the broad whitish band across the face above the eyes, and proposed for it the subspecific name *Connochætes taurinus johnstoni*. From the British-East-African form

E. Caldwell del. J. Smit lith.

CONNOCHÆTES TAURINUS JOHNSTONI.

Mintern Bros. imp.

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MUSEUM

(*C. t. albo-jubatus*) it differed in having the mane black, as in *C. t. typicus*.

Mr. Richard Crawshay, C.M.Z.S., made the following remarks on this subject:—

"This Gnu from British Central Africa is most interesting, especially to naturalist-sportsmen like myself who have visited the country.

"The existence of a Gnu in the Protectorate has, of course, long been known: for instance on the Mlanji Plains, to the S.E. of Matope, on the Upper Shiri, there are a few; and to the W. of Lake Nyasa, in the Loangwa R. valley, which drains into the Upper Zambesi, there are also some. Hitherto, however, only two specimens have been shot by Europeans, so far as I know. These are the one of which we have this very pretty drawing; and one other, also a fine male, lately shot by Mr. Carl Wiese on the left bank of the Ruo R., not far from Chiromo, on the Lower Shiri R. Passing through Chiromo, about two months ago, I was shown the skull and magnificent long silky tail of this Gnu of Mr. Wiese's: both are in Mr. Hillier's possession at Chiromo.

"The specimen now forwarded by Sir H. H. Johnston was shot, if I recollect rightly, by Mr. Macdonald, of the Administration, on the Mlanji Plain. I think he told me he saw three in all—a bull, a cow, and a calf; he secured the bull the second time he saw it by a long shot.

"During thirteen years' residence, off and on, in what is now the Protectorate, I have never myself actually seen Gnus; the nearest I have been to them is to see their spoor, about four or five miles out from Matope, on the Upper Shiri R.

"The tribes round the southern half of Lake Nyasa all know the Gnu by name: some people that I have heard describe the animal say it has horns like a Buffalo.

"The Anyanja know it as 'Nyumbu'; the Yaos (Ajawa) as 'Sindi,' though I did not know this when I wrote my paper on the Antelopes of Nyasa six years ago. Intermixing as they do very much with the Anyanja, the Yaos often use Manganja words, especially with Europeans, who mostly speak Manganja.

"The Yaos of Cape Maclear at one time used the tail-hairs of the Gnu to string beads on their prettily worked hair-combs; I think I must have some of these combs by me even now.

"Being traders and great travellers, these Yaos, I imagine, have accompanied Arab caravans on their journeys into the Lower Loangwa valley, and got their Gnu-tails there. During August and September last year I made a journey into the Upper Loangwa valley, seven days or so S.W. from Karonga. There I saw a great deal of game, but no Gnus, though the Wasenga, I found, are well acquainted with this animal.

"They told me I should find Gnus two or three days to the S. of where I then was, at Msongozi's; they said I should see plenty in the neighbourhood of Kambombo's town. Wishing very much indeed to verify this statement and to secure a specimen of the

Gnu, I left Msongozi's on the Loangwa R. and struck down the valley with the object of making Kambombo's. But I had only gone one day's journey to Mwankanka, when we were fired on by a colony of slave-traders settled there under a half-bred Arab, and further progress was quite out of the question."

Mr. R. E. Holding exhibited and made remarks on a fine shed antler of the Circassian Red Deer (*Cervus maral*), which had been shipped with a cargo of bones and horns from Tiflis, on the Black Sea. The antler had 9 well-developed points, weight 9 lbs. 2 oz., its length of beam 41 inches, length of brow-tine 18 inches.

Mr. Holding also exhibited, on behalf of W. Burton, Esq., F.Z.S., an abnormal pair of horns of the Wild Goat from the Caucasus, having a curious inward spiral form (see figure).

Abnormal horns of Wild Goat from the Caucasus.

The following papers were read:—

1. A Contribution to the Anatomy of the Hoatzin (*Opisthocomus cristatus*). By P. Chalmers Mitchell, M.A., F.Z.S.

[Received June 2, 1896.]

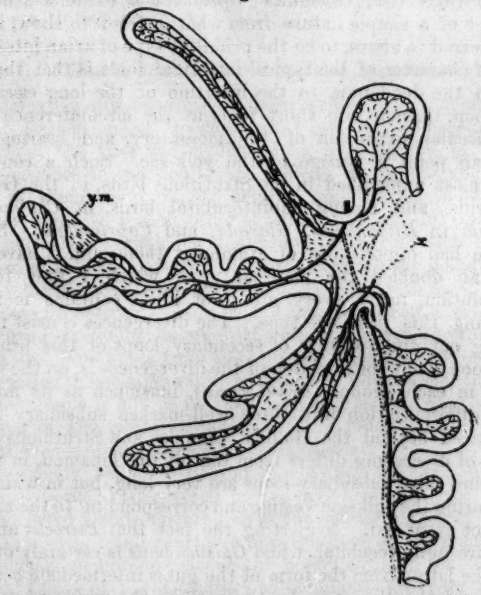
The material upon which this communication is based consists of several specimens of the Hoatzin, preserved in spirit, and kindly given me by Mr. F. V. McConnel, whom my friend Mr. F. W. Headley told that they would be of service to me. I am indebted to the Society and to its Prosector for the continued use of the

laboratory at the Gardens in the course of my investigations into the anatomy of birds. A number of important memoirs have appeared upon the Hoatzin, but, in the present condition of our knowledge of the relations among the groups of birds, additional details concerning the structure of a type so aberrant may prove useful.

Alimentary Canal.

The extraordinary crop and the general characters of the gizzard and intestines have been sufficiently described by L'Herminier[1] and Gadow[2]. Following the method which I have described in a former paper[3], I dissected out the coils of the intestine and the

Fig. 1.



Intestinal convolutions of *Opisthocomus cristatus*.
x, bridging vessel divided; *y.m.*, mesentery of the yolk-sac vestige.

great veins in a well-grown chick and in three adults. As shown in figure 1, the duodenal loop is unusually short and wide, and is much less specialized than in most other birds I have examined.

[1] "Recherches anatomiques sur quelques genres d'oiseaux rares ou peu connus," Ann. Sci. Nat. sér. 2, Zoologie, viii. Paris, 1837.
[2] "On the Taxonomic Value of the Intestinal Convolutions in Birds," P. Z. S. 1889, p. 303.
[3] "On the Intestinal Tracts of Birds," P. Z. S. 1896, p. 136.

The mid-gut is thrown into three well-marked loops: the first of these is long and narrow; the second is long, is much more open, and shows a tendency to be thrown into a very rough spiral. In the chick and in two adults I found no trace of the yolk-sac diverticulum, but its place of attachment was marked by a distinct and strong remnant of the ventral mesentery; in a third adult, as shown in the figure, this mesentery ran to a minute vestige of the yolk-sac, placed nearly at the summit of the middle loop. The third loop of the mid-gut is wide, and along it the cæca run in the fashion characteristic of birds in which these are functional; where the duodenum lay over this third loop, a bridging vein ran from the cæca to the duodenal branch of the mesenteric vein. The rectum is very long and is thrown into secondary folds.

It is obvious that the gut of *Opisthocomus* exhibits a definite divergence of a simple nature from what I tried to show, in the paper referred to above, to be the primitive type of avian intestines. The chief character of the typical intestinal folds is that the mid-gut, from the duodenum to the insertion of the long cæca, is a simple loop, thrown into short folds at the circumference of an almost circular expansion of the mesentery, and bearing near its median point a vestige of the yolk-sac. Such a condition occurs almost unmodified in the Struthious birds, in the Gallidæ and Cracidæ, and, among aquintocubital birds, in *Chauna* and *Palamedea*, in *Himantopus*, *Glareola*, and *Caprimulgus*. So far as I have had opportunity of examining them, and I have now more than doubled the material upon which I first formed the conclusion, nearly every group of birds contains members approaching this primitive type. The divergences consist in the stretching out and twisting of secondary loops of this primitive circular loop, while the direction of the divergences is, on the whole, identical in each group. *Opisthocomus*, inasmuch as its mid-gut displays differentiation into three well-marked subsidiary loops, has advanced beyond the Gallidæ, Cracidæ, and Struthious birds. Its mode of divergence differs from that of the Tinamou, in which the first and third subsidiary loops are very long, but in which the region bearing the yolk-sac vestige and corresponding to the median loop is not expanded. Neglecting the fact that *Pterocles* and the Pigeons are aquintocubital, while *Opisthocomus* is certainly quintocubital, the latter from the form of the gut is intermediate between *Pterocles* and the Pigeons. In these three the mid-gut has three loops, the central loop bearing the yolk-sac vestige: as in *Pterocles* the cæca are long; the middle loop shows a trace of the spiral formation which is characteristic of the higher Pigeons. Among quintocubital birds *Opisthocomus* shows the closest resemblance to the Cuculidæ, in which also the cæca are long and the mid-gut is thrown into three loops, the median loop bearing the yolk-sac vestige. So far as argument may be based upon the formation of the mid-gut, either Huxley's[1] suggested relationship between

[1] "On the Classification and Distribution of the Alectoromorphæ and Heteromorphæ," P. Z. S. 1868, p. 294.

Opisthocomus, Fowls, and Pigeons, and Garrod's[1] suggested relationship with Fowls and Cuckoos, is borne out. But the Gallinaceous birds are more primitive in the character of their mid-gut, and from this point of view *Opisthocomus* must be regarded as less primitive than them, while both Huxley and Garrod from other considerations regard it as more primitive.

The subsidiary looping and consequent length of the rectum or large intestine between the insertion of the cæca and the cloaca is a striking feature found only in few birds, all of which have the intestines otherwise primitive: it reaches a maximum in the Ostrich, giving the intestine of that bird a curiously mammalian aspect; it is absent in *Casuarius*, *Dromæus*, *Apteryx*, and *Rhynchotus*; it is well-marked in *Rhea*, *Chauna*, *Palamedea*, and in *Opisthocomus*. I am unable to correlate it with any degree of development of the cæca or with habits or food.

Muscles of the Visceral Skeletal Apparatus.

Although many papers have been written which include myological descriptions of *Opisthocomus*, I can find no account of the muscles of the jaws and hyoid. In a large number of birds the hyoid muscles in particular are difficult to isolate and dissect; many of them are extremely delicate, and the fasciæ of adjacent muscles blend with each other at many points. In *Opisthocomus* these muscles are particularly stout and free from each other; on removal of the skin covering the space between the mandibles they may be dissected out (see fig. 2, p. 622) with great ease.

Mylohyoid anterior.—This pair of muscles forms a broad transverse band stretching between the inner edges of the rami of the mandible. The fibres from the opposite sides pass straight across, not meeting in a median raphe as occurs in *Chauna* and the Goose; but the muscle is not, as in *Palamedea* and the Goose, divided into an anterior and posterior portion. It is much stouter than in a typical Pheasant like *Lophophorus impeyanus*.

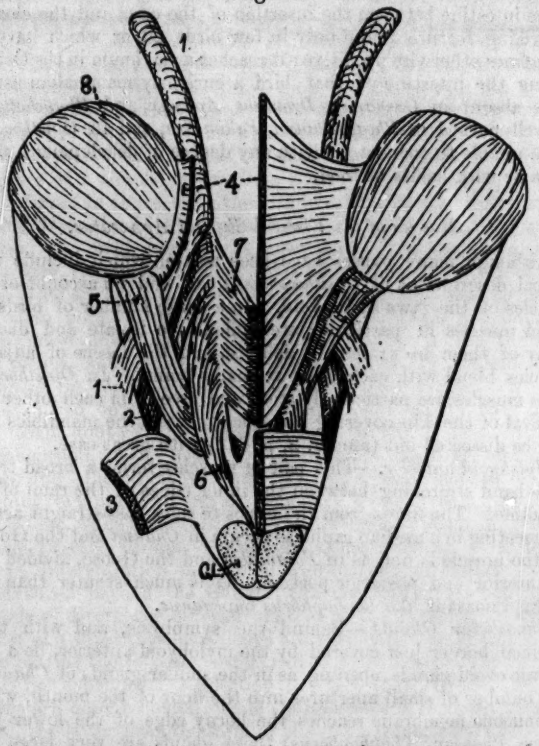
Mandibular Glands.—Behind the symphysis, and with their proximal border just covered by the mylohyoid anterior, lie a pair of large ovoid glands, opening, as in the similar glands of *Chauna*[2], by a number of small apertures into the floor of the mouth, where the mucous membrane reaches the horny edge of the lower jaw. In the Pheasant (*Lophophorus*) these glands are very large and lobulated.

Mylohyoid posterior.—This, as in all birds that I have examined, or of which I can find record on the point, is a large muscle dividing almost immediately into an anterior deeper layer and a posterior more superficial layer. In *Opisthocomus* there is a large common origin from the outer side of the ramus of the jaw, immediately anterior to the insertion of the *depressor* muscle. From this comes the whole of the posterior, more superficial division of the

[1] "On the Anatomy of the Hoatzin," P. Z. S. 1879, p. 109.
[2] "Anatomy of *Chauna chavaria*," P. Z. S. 1895, p. 350.

muscle, which spreads anteriorly and posteriorly over the lower surface of the space between the jaws, reaching forwards nearly to the posterior border of the *mylohyoid anterior*, and meeting its fellow from the other side in the middle line. The anterior or deeper division of the *mylohyoid posterior* has its origin partly in

Fig. 2.



Dissection of hyoidean muscles of *Opisthocomus cristatus*.

1. Geniohyoid, posterior division. 2. Geniohyoid, anterior division. 3. Mylohyoid anterior. 4. Mylohyoid posterior, posterior division. 5. Mylohyoid posterior, anterior division. 6. Ceratoglossus. 7. Ceratohyoid. 8. Depressor mandibulæ. *Gl.*, Mandibular gland.

common with the foregoing division, but also extending a considerable distance over the inner surface of the ramus, a condition that I have not found in any other bird. In the Pheasants the origin is normal, a narrow nearly vertical line in front of the *depressor mandibulæ* attachment.

Geniohyoid.—This muscle is in two distinct portions. The posterior division arises from the outer side of the ramus of the jaw, behind the anterior mylohyoid; it passes dorsally to both divisions of the posterior mylohyoid, and, running inwards and backwards, wraps round the ceratohyal to the tip. The anterior portion arises from the inner side of the ramus of the jaw, its edge being superficial to the *mylohyoid anterior*; it then runs forwards and inwards alongside the posterior division of this muscle, and is inserted to the ceratohyal, partly under and partly distally to the insertion of the posterior division. Gadow ('Das Thierreich,' p. 313) states that the geniohyoid is double in *Nectarinia*, *Otis*, Parrots, and *Rhea*; single in *Corvus*, *Anser*, *Procellaria*, and *Spheniscus*. Beddard and I found it single in *Palamedea*; I myself have found it single in *Chauna*, *Rhytidoceros*, *Cygnus*, *Pelecanus*, and *Lophophorus*; double in *Struthio*, *Dromœus*, *Rhea*, *Rhynchotus*, and *Ciconia*. It appears as if this muscle were comparable with the latissimus dorsi; originally a diffused sheet it tends to break up into two discrete bands, but there are not sufficient data to draw any inferences of taxonomic value from its double condition in *Opisthocomus*. The researches of Garrod showed that, in the case of certain notable thigh-muscles, completeness of muscle formulæ was, on the whole, primitive, while incompleteness was secondary. In the attempt to extend this view to other muscles it is necessary to remember that many muscles are in process of splitting, and that in these cases increase in number is a sign, not of primitive, but of derivative character.

Genioglossus.—At the most this is represented by a few fibres.

Ceratoglossus.—This is a very strong muscle, arising from the outer side of the ceratohyal, anterior to the *geniohyoids*; it passes forwards, superficially to the anterior division of the *mylohyoid posterior*, and deeply as regards the *mylohyoid anterior*; ending in a round tendon, it is inserted along the side of the tongue almost to the tip. There is no trace of the division into two, which occurs in Fowls.

Ceratohyoid.—This is a strong wide muscle running from the inner side of the ceratohyal, opposite the insertion of the foregoing muscle to the urohyal.

The *hypoglossals* and the system of the *sterno-hyoid* were present, but the individual muscles were not segmented from each other.

Depressor mandibulæ.—A single very large muscle, of which the internal portion is more tendinous, runs from the lateral posterior and under surface of the occiput to the posterior and ventral part of the lower jaw. In Ducks and Geese this muscle is represented by three distinct portions, all of which Beddard and I found in *Palamedea* [1], and described as *biventer* and *digastric*. In the Fowls there are at least two portions separable; in *Opisthocomus* the tendinous inner portion no doubt represents an inner portion,

[1] "On the Anatomy of *Palamedea cornuta*," P. Z. S. 1894, p. 536.

which is separate and muscular in *Palamedea*, separate and tendinous in *Gallus*.

Temporalis.—The superficial portion of this muscle is very large and inseparable into layers; it arises from the whole temporal fossa, and from the external and internal surfaces of the mid-temporal process; it runs forwards and downwards under the quadrato-maxillary bar to the outer upper surface of the lower jaw; internal to this, and arising from the deeper region of the temporal fossa, is a strongly marked pyramidal muscle, which ends in a stout tendon inserted to the inner surface of the lower jaw. A still deeper portion runs across from the forward process of the quadrate to the inner side of the ramus. Lastly, a wide band of muscle bridges the narrow interval between the inner edge of the forward process of the quadrate and the wall of the orbit behind the optic foramen.

Pterygoid.—A superficial portion, similar to that found in Ducks and Geese runs from the ventral, posterior end of the lower jaw to the palatal membrane. It is not so tendinous as in the Ducks and Geese. The deeper portion of the pterygoid is an almost continuous mass of muscle, inseparable into regions, from the pterygo-palatine area to the lower jaw.

Muscles of the Leg.

Variations in the Conditions of the Ambiens.

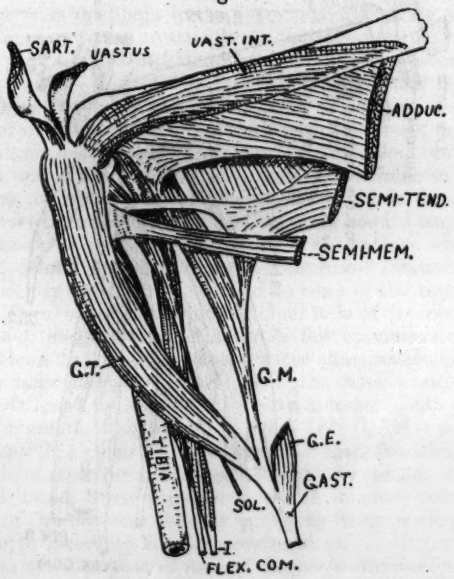
In the musculature of the leg there are several points (illustrated by figure 3, p. 625, and figure 4, p. 626) to which I wish to refer. As Garrod showed, the four muscles which he called A, B, X, and Y, the femoro-caudal and its accessory, the semitendinosus and its accessory, are all present. The interconnections between the muscles at the back of the knee differ so in birds that a description of their exact condition in *Opisthocomus* may be placed on record, although I have not yet sufficient material to make comparisons of any value.

The *adductors* have no insertion to the tibia, but send a strong slip to the middle head of the gastrocnemius. The semimembranosus, the most posterior of the thigh-muscles, runs straight in to the tibia, unconnected with the tendon of the semitendinosus. The accessory semitendinosus is very broad and strong, but does not nearly reach the tibia, being separated from that by the middle head of the gastrocnemius. The semitendinosus, after being joined by its accessory, sends in one fibrous slip to the tibia, proximal to that of the semimembranosus; while the greater mass of the muscle ends in a strong tendon, which runs down alongside and soon fuses with the middle head of the gastrocnemius, before that reaches the tibial head.

The condition of the *ambiens* muscle is still more interesting. Garrod (see paper referred to above) examined the legs of three specimens of *Opisthocomus*. In all cases he found the *ambiens* small, but normal, above the thigh. In five of the six legs it was

lost in the tendon over the knee, through which, in the normal condition, it passes. I dissected carefully for the *ambiens* in each leg of two of my specimens. In one case the *ambiens* was completely absent above the knee, and there was no trace of its tendon in the fasciæ and tendon over the knee. But in each of these legs (as shown in fig. 4, p. 626) a strong round ligament left the fibula, in the position in which the *ambiens* tendon of a bird with a normal *ambiens* crosses the fibula. This tendon passed down and sent a branch to each of the three *perforated flexors* of the

Fig. 3.



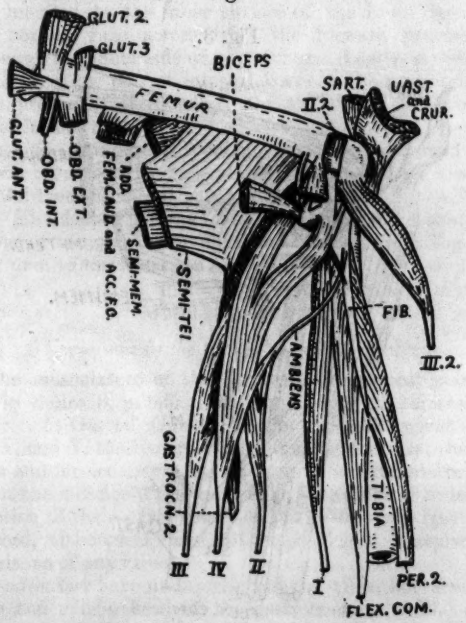
Thigh-muscles of *Opisthocomus cristatus*; posterior view.

Sart., Sartorius. *Vast.int.*, Vastus internus. *Adduc.*, Adductors. *Semitend.*, Semitendinosus. *Semimem.*, Semimembranosus. *G.t.*, Gastrocnemius, tibial head. *G.m.*, Gastrocnemius, middle head. *G.e.*, Gastrocnemius, external head. *Sol.*, Soleus. *Flex.com.*, Flexor communis digitorum, I. Flexor longus hallucis.

digits. In a second specimen I found the *ambiens* above the knee. The tendon was lost at the knee-joint, but a rudiment slightly different from that in the first case was present in each leg below the knee. From the fibula, immediately distal to the attachment of the *biceps* tendon, three fibrous slips passed respectively to the perforated flexor muscle for the second, third, and fourth digits. It is well known that Garrod regarded the

presence or absence of the *ambiens* muscle as of primary importance. He divided birds into the Homalogonatæ, which possess the muscle, and the Anomalogonatæ, in which it is absent. Here and there among groups which certainly must be associated with the Homalogonatous birds there are instances in which the *ambiens* is absent, and in which Garrod believed the *ambiens* to have been present, but recently lost. It is of great interest therefore to

Fig. 4.



Leg-muscles of *Opisthocomus cristatus* showing vestigial *ambiens*.

Glut. 2, Attachment of gluteus medius. *Glut.* 3, Attachment of gluteus tertius. *Glut. ant.*, Gluteus anterior. II. 2. Flexor perforans et perforatus indicis. III. 2, Flexor perforans et perforatus medii. *Per.* 2, Peroneus secundus. I. Flexor longus hallucis. II. Flexor perforatus indicis. III. Flexor perforatus medii. IV. Flexor perforatus quarti.

find a species different individuals of which show so great variations in the condition of the *ambiens* muscle, reaching from the normal complete condition found by Garrod to the extremely vestigial condition in the specimen from which fig. 4 was drawn. Some time ago, in a paper communicated to this Society [1], I recorded the discovery of vestiges of the *ambiens* in the case of two

[1] "On the Perforated Flexor Muscles in some Birds," P. Z. S. 1894, p. 495.

birds which, although they are certainly to be placed among the Homalogonatæ and have close allies in which the *ambiens* is normal, are themselves without it. In *Nycticorax gardeni* the *ambiens* is absent; but in two specimens that I have dissected I found a slip to the flexor muscles from the fibula, similar to that in the *Opisthocomus* here figured, although it arose rather lower down the fibula. In *Eclectus roratus*, which again is devoid of an *ambiens*, although many Parrots are provided with it, I found a vestige almost precisely similar to that present in my second specimen of *Opisthocomus*, in which the *ambiens* ended on the knee. The vestige in *Eclectus*, as in the second *Opisthocomus*, consisted of three slips from the fibula to the flexor tendons. This additional evidence appears to me to strengthen the case for the taxonomic value of the *ambiens* considerably. While there were known only the rudiments described by me in *Eclectus* and *Nycticorax*, it might have been open to doubt whether or no these really were vestiges of an *ambiens*. Now that there have been found in different individuals of *Opisthocomus* graded vestiges linking my rudimentary condition with a complete *ambiens*, there seems no room to doubt that some, at least, of the Homalogonatous birds devoid of an *ambiens* have once possessed it. On the other hand, I may mention that although *Dissura* is a Stork without an *ambiens*, while other genera of Storks possess it, in two specimens of *Dissura episcopus* I have recently dissected I could find no trace of the vestige.

Apart from possible systematic value, it is of interest to find variations of so great magnitude in a few specimens of a bird. Prof. Weldon has recently shown, after examination of an exceedingly large number of individuals of the shore-crabs, that very slight deviations may be associated with a larger death-rate. In the case of creatures so difficult to shoot as is *Opisthocomus* it may be the case that those actually examined have, from the greater magnitude of their variations, been less able to escape.

In conclusion, I may place on record three minor points in the myology of *Opisthocomus*, the only remaining features which seemed to me worth recording at the present time.

Tendons of the perforated and of the perforated and perforating flexors of the third digit.—In most birds the tendons of these are connected by a short stout vinculum immediately before they reach the foot. Gadow mentions that this occurs in Ratites, Fowls, and in *Pterocles*. I can add to this a very long list of birds, including *Rhynchotus*, *Chauna* and *Palamedea*, *Balearica*, *Psophia*, and *Fulica*. The slip is absent in *Opisthocomus*; the only other cases that I remember in which this occurs are *Asio otus* and *Rhytidoceros plicatus*.

Short flexors from the deep plantar tendons.—The tendon of the *flexor longus hallucis* is connected with the tendon of the *flexor perforans* by a strong vinculum and then supplies the thumb. A strong muscular slip, certainly absent in most birds, leaves the *longus hallucis* tendon immediately distal to the vinculum and runs to the fourth digit. A similar muscular slip leaves the tendon of

the *flexor perforans* and runs to the third digit. These slips are in addition to the ordinary short flexors, and it is possible that they throw light upon the origin of the very peculiar modes of distribution of the hallucis tendon in some groups of birds, as it has been repeatedly shown that a tendon may be the homologue of a muscle.

Entepicondylo-ulnaris.—This muscle, which according to Gadow is present only in Rasores and in the Tinamou, is absent in *Opisthocomus*. This is another of the innumerable points separating *Opisthocomus* from Fowls.

2. On the Occurrence of Schlegel's Gavial (*Tomistoma schlegeli*) in the Malay Peninsula, with Remarks on the Atlas and Axis of the Crocodilians. By G. A. Boulenger, F.R.S.

[Received May 29, 1896.]

A Gharial-like Crocodile, *Tomistoma schlegelii*, described by Salomon Müller in 1838, was, until lately, believed to be peculiar to Borneo. In 1890, however, its occurrence in Sumatra was recorded by Max Weber (Zool. Ergebn. p. 176). The Malay Peninsula may now be added to its habitat.

A few months ago, the British Museum received, from Mr. L. Wray, Curator of the Perak Government Museum, a fine half-grown specimen, with the following remarks:—

"The specimen was caught at Pulau Tiga, in the Perak river, in June 1895, and I kept it in a pond until the end of December, when it was killed. For months it would eat nothing but a few small fish, but during the later portion of the time it would eat freely of any meat or fish given to it. It also became quite tame and would remain at the surface of the water with its head on the bank while people stood near it.

"So far as I have been able to ascertain, no Crocodile belonging to the Gavial group has ever been recorded from the Malayan Peninsula, so that the following particulars will be of interest.

"I first heard of the occurrence of a Gavial in the State of Perak in 1889, and in the same year Mr. Cecil Wray, the then Acting Superintendent of Lower Perak, obtained a skull from the Perak river, and sent it to the Perak Museum; the animal was 7 feet long. A second was caught in the Kinta river, near Batu Gajah, in 1893 or 1894. It was secured by Capt. H. C. Metcalfe, of the Perak Sikhs, and the skin is now in his possession. It measures 6 feet 8 inches, but the tail is very short, having probably been injured when young; the head measures 18 inches, the upper jaw 30 inches, and the lower jaw 23 inches. A third was taken from the Batang Padang river near Tapah, and was seen by Mr. Page, the Inspector of Police at Tapah. It was

stated to have been a small one, only measuring about 4 feet long, and, unfortunately, it was not preserved.

"Mr. J. P. Rodger informed me that, when he was British Resident in Pahang, he had seen the skull of one belonging to the late Mr. E. A. Wise, that had been caught in the upper part of the Pahang river. The fifth was trapped in the Perak river at Pulau Tiga, some 64 miles from the mouth. This animal measured 8 feet 9 inches, and is the largest yet seen.

"I was imformed some years ago that one was taken to the Police station at Telok Anson for the reward, measuring 19 feet in length. The Police Inspector showed me where it was buried, but I failed to find it. Four skeletons were dug out, but they all proved to be common Salt-water Crocodiles (*Crocodilus porosus*). There is therefore considerable doubt about the accuracy of this information, and probably the animal was only a rather narrow-headed common Crocodile and not a Gavial at all.

"These are all the instances of its occurrence that I have been able to collect, and so far the evidence would go to show that it is confined to the Perak and Pahang rivers and some of their larger tributaries; though it is probable that it will hereafter also be found in the Kelantan and possibly in the Telubin river.

"It is called by the Malays 'Buaya Jinjulong,' or the Long-snouted Crocodile; but from its rarity there are only a very few who have ever either seen or heard of it. There are two other crocodiles frequenting the coasts and rivers of the Peninsula, viz. the Salt-water Crocodile (*Crocodilus porosus*, Schn.) and the Marsh Crocodile (*C. palustris*, Less.). These are called respectively 'Buaya' and 'Buaya Katak,' or the Frog Crocodile, by the Malays. 'Buaya Tembaga,' that is the Brass Crocodile, is a name often heard, but it only has reference to the colour, being indifferently applied to all yellowish-tinted ones without regard to their species.

"The Malayan Gavial would appear to be essentially a freshwater animal, and it is said by the natives to often frequent the swamps and marshy lands on the banks of the rivers. If this is really the case, it differs somewhat in its habits from the *Gavialis gangeticus*, which is much more aquatic than the Crocodile. In the ordinary way, so far as my observations have gone, only the upper part of the end of the nose and the two eyes are above the water. On the approach of anyone the eyes slowly and quite silently sink beneath the surface and nothing but a small portion of the nose remains: on a nearer approach this also quietly disappears. This doubtless accounts for the fact that the animal is so very rarely seen.

"The irides are yellowish brown and the pupils vertical. The upper surface is pale dull olive-green, finely and closely spotted with dark brown. The ground-colour becomes lighter on the sides and is nearly white beneath. The tail has six dark bands, formed by the spotting of the scales on the sides and lower surface with dark brown. In the living animal the upper jaw projects nearly an inch beyond the under jaw.

"It is possibly referable to *Tomistoma schlegeli*, the Bornean Gavial, but the very meagre description of that species in my possession is insufficient to identify it."

The specimen sent by Mr. Wray has been stuffed, and is now exhibited in the Reptile Gallery of the Natural History Museum. As the bones were sent with the skin, I am able to add some remarks on the osteological characters, of which we know nothing, except of the skull, which has been well described and figured.

There are 24 præsacral, 2 sacral, and 35 caudal vertebræ. The

Fig. 1.

Atlas and axis of *Tomistoma*, ventral and side views.

(The posterior condyle of the axis is omitted.)

c. Centrum.
ha. Hypapophysis.
na. Neural arch.
r. Rib.

hypapophyses on the cervical and anterior thoracic vertebræ are less developed than in the other recent Crocodilians, and are not directed forwards; they are not developed beyond the eleventh vertebra (twelth or thirteenth in the others). The chevron-bones are all open dorsally. The first pair of ribs are inserted on the sides of the proatlanto-atlantic hypapophysis, or lower part of the atlas-ring, and separated from each other at the base by a wide interspace. The second rib differs from that of all Crocodilians I have hitherto examined (including the Gavial, of which I have examined the bone on a young specimen in spirit, and also the atlas and axis preserved in the Museum of the Royal College of Surgeons,—the Gavial-skeleton still being a desideratum in the British Museum Collection), *Osteolæmus* excepted; it is attached to the centrum of the atlas (odontoid bone), near its suture with the axis, by the capitulum only, the tuberculum being merely indicated by a small upward process at a distance from the base of the bone, and without any connection with the vertebræ.

It is well known that in *Ichthyosaurus* the atlas bears a forked rib, same as the axis and the other vertebræ behind it. It seems that one Crocodilian at least presents an approximating feature. The late Mr. Hulke has first pointed out in *Metriorhynchus* (P. Z. S. 1888, p. 419) the presence on the "lateral pieces" (neurapophyses) of the atlas of a tubercle situated in the level of the diapophysis on the epistropheus, and he concludes that this tubercle should rank as an upper atlantal transverse process or diapophysis. I have been able to verify the correctness of this statement on several well-preserved atlases of *Metriorhynchus*, still undescribed, from the Leeds Collection, which my colleague Mr. Andrews has kindly shown me in the Geological Department of the British Museum; and I quite agree with Hulke that "the position of this little process in serial line with the upper transverse processes of the other cervical vertebræ speaks distinctly in favour of its diapophysial character." We are, in consequence, justified in assuming that, although, as we know from one specimen, the first rib is not forked, it must have been connected with the diapophysis by ligament, its head being attached to the side of the hypapophysis ("basilar piece") of the atlas, or rather between the latter and the centrum (odontoid bone); and such a condition may be regarded as the most primitive known among Crocodilians, and as one from which, as Hulke has shown, the abnormal position of the first rib of recent forms may be derived and explained.

The second rib in *Metriorhynchus* was attached by its capitulum to the anterior border of the lower surface of the centrum of the axis, or between the latter and the centrum of the atlas, and by its tuberculum to a process (diapophysis) of the neurapophysis of the axis.

As regards recent Crocodilians, the information to be derived from books appears contradictory, principally from the fact that the various authors have dealt with different genera, and have in some cases generalized their observations to the whole group.

Cuvier (Ossem. Foss.) describes and figures the second rib in *Crocodilus porosus* as single-headed and attached to the odontoid bone. Owen (Osteol. Cat. Mus. Coll. Surg.) ascribes to the same rib, in *Gavialis gangeticus*, a forked head attached to two transverse processes of the odontoid bone. According to Stannius (Zoot. Amph. p. 26), the rib is forked and the two branches are attached on the limit between the odontoid bone and the centrum of the axis. Brühl (Skel. Crocod.) figures, in *Caiman palpebrosus*, the rib as forked, with capitulum and tuberculum on the odontoid bone, near its suture with the axis. In Huxley's 'Anatomy of Vertebrated Animals' it is described in Crocodilians generally as attached to the os odontoideum and to the second centrum by distinct capitular and tubercular processes. Baur (Amer. Nat. 1886, p. 228) was the first in attempting to show what, if any, differences exist between the genera with regard to the shape of the second rib and its attachment to the vertebræ. I am not able to confirm his statements regarding *Gavialis* and *Alligator*. In the case of the latter, the more forward position assigned by him to the costal capitulum may be due to individual variation; but I cannot help thinking the author is mistaken in attributing a rudimentary diapophysis to the neural arch of *Gavialis*. In the specimens I have examined two very distinct processes are present on the axis-centrum, and I have satisfied myself on a specimen in spirit that the ligamentous capitulum is attached to the upper of these processes, which is widely separated from the supposed diapophysis figured by Dr. Baur.

I have examined the atlas and axis in *Gavialis gangeticus*, *Tomistoma schlegeli*, *Crocodili niloticus*, *americanus*, and *porosus*, *Osteolæmus tetraspis*, *Alligator mississippiensis*, *Caiman sclerops* and *C. latirostris*, and find important differences, which are deserving of notice.

In *Alligator*, the first rib is attached to the lower surface of the hypapophysis and in contact with, or narrowly separated from, its fellow at the base; the second rib, in the adult, is deeply forked and attached by its capitulum to the centrum of the atlas, by its tuberculum to the anterior part of the centrum of the axis, which, however, does not develop any tubercle or transverse process. In a new-born specimen I find both capitulum and tuberculum inserted on the axis, showing the rib to shift forward with age, a further confirmation of the view that this rib, usually attached to the first vertebra, really pertains to the second.

In *Caiman*, the first rib is as in the preceding, but the second, deeply forked, is entirely on the centrum of the atlas, without the latter bearing processes for its attachment.

In *Crocodilus*, the first rib is more on the side of the hypapophysis and widely separated from its fellow; the second is but feebly notched in its próximal portion, and the somewhat ill-defined capitulum and tuberculum join two strong knob-like processes on the centrum of the atlas.

In *Gavialis*, the first rib conforms to the preceding type, but

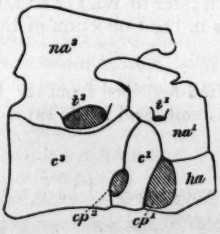
the second is deeply bifurcate, the tuberculum ligamentous, and attached to two processes on the centrum of the atlas.

Tomistoma has been noticed above. *Osteolæmus*, curiously, agrees with it.

We thus see that *Metriorhynchus* represents the most generalized condition, and that the recent Crocodilians, each departing in its way from the primitive type, cannot be arranged in a continuous series in this any more than in several other parts of their structure. Whilst more generalized in respect to the second rib [1] than the true Crocodiles, the Alligator is more specialized in the more aberrant position of the first rib; the Gavial agrees with the Crocodile in the position of the first rib, and with the Alligator and Caiman in the strong bifurcation of the second; and *Tomistoma* and *Osteolæmus* present the highest specialization in the condition of the second rib with rudimentary tuberculum.

P.S. (June 18, 1896).—Two days after the reading of my paper, I received Dr. Gadow's memoir on the Vertebral Column of Amphibia and Amniota (Phil. Trans. clxxxvii. B. pp. 1–57). In this he gives an account and a diagrammatic figure of the atlas and axis of *Metriorhynchus*, which differ entirely from what I have observed. I at once re-examined the specimens, and particularly that described by Hulke and figured by Dr. Gadow, and find

Fig. 2.



Atlas and axis of *Metriorhynchus*.

c. Centrum.
cp. Capitular facet.
ha. Hypapophysis.
na. Neural arch.
t. Tubercular facet (diapophysis).

the latter's statement to be erroneous. What is figured as the first centrum is a portion of the first neural arch, the posterior portion of which has passed, on the figure, into the second vertebra; the tubercle (t^1), to which allusion is made, is on the neural arch. I append (fig. 2) a corrected sketch of the specimen figured by Dr. Gadow.

[1] Another character in which *Alligator* is more generalized than *Caiman* and *Crocodilus* exists in the proatlas, the arches of which are distinct or show at least a trace of separation, which is not to be found in the other genera, even in quite young specimens.

3. On Walker's American Types of Lepidoptera in the Oxford University Museum. By W. Schaus, F.Z.S.

[Received April 30, 1896.]

The following notes on Walker's American types in the Oxford University Museum are to be followed by others, wherein the complete synonymy will be given of many of the species, and references will also be made to those species which as yet remain unidentified. My special thanks are due to Prof. E. B. Poulton, F.R.S., for the trouble he took in selecting the American Moths from the Hope Collection, and sending them family by family to the British Museum to be compared with the collections there and with my own collection; and to Mr. G. F. Hampson for his untiring kindness and assistance. Those species marked with an asterisk are represented in my own collection; those of which I do not possess specimens, and which are not in the British Museum either, have been figured in duplicate, one set of figures being placed in the Entomological Department of that Museum. The species described by Walker in parts 27–30 of his Catalogue, and in the corresponding portions of the Supplement, as being in "Coll. Saunders" never formed part of the Hope Collection of the Oxford Museum, but have lately been purchased by the British Museum, where the types are now to be found.

The references given refer to Walker's 'List of the Specimens of Lepidopterous Insects in the Collection of the British Museum.'

Vol. III.

P. 775. **Norape puella* described from the Fry coll. is now in the Saunders coll., and is the same as *Archylus pectoralis*, Walk.

Vol. IV.

P. 801. *Sarsina purpurascens*. I have not yet been able to find the type.

P. 895. **Darala falcata*=*Lonomia submacula*, Walk.

P. 957. *Isychagrapha floccosa*. Not identified.

Vol. V.

P. 1046. **Naprepa camelinerdes* is a distinct species belonging to the Notodontidæ.

P. 1115. *Laruma heterogenea* is a distinct species, the genus being the same as *Hydrias*.

P. 1152. *Nesara apicalis* belongs to the genus *Ocha*, Walk.

P. 1155. **Pamea excavata* and *Pamea notata* are the sexes of one species.

P. 1155. **Pamea vittata* belongs to the genus *Carthara*, Walk.

P. 1170. *Rosema deolis* is not Cramer's species, and I therefore propose the name of *R. walkeri* for it; the species is well described by Walker.

VOL. V. (*continued*).

P. 1176. **Tepilia biluna* is the same as *Phecada confinis*, Walk.

P. 1195. **Lonomia albigutta* is a well-known species, but will no doubt sink as a synonym of one of Cramer's species.

VOL. VI.

P. 1264. *Tropæa dictynna*. Evidently a distinct species and not a mere var. of *T. luna*.

P. 1300. **Hyperchiria memusæ*. A good species allied to *H. leucane*, Hbn.

P. 1301. **Hyperchiria cinerea*. The ♀ of *H. janeira*, Westwood.

P. 1301. *Hyperchiria pyrrhomelas* is a good species.

P. 1303. **Hyperchiria submacula* has been redescribed by Boisduval as *H. dioxippus*.

P. 1313. **Hyperchiria vagans* is a species of *Dirphia*.

P. 1326. *Rhescynthis meander*. This is well figured by Maassen and Weymer.

P. 1329. **Dysdæmonia glaucescens*. A distinct species.

P. 1338. *Mimallo plana* belongs to the genus *Perophora*.

P. 1364. **Dirphia multicolor* is a distinct and well-known species.

P. 1402. **Hydrias albidifascia*. A distinct species.

P. 1402. **Hydrias plana*. A distinct species.

P. 1403. *Hydrias confusa*. The type is the only specimen I have seen of this species.

P. 1507. *Hydrias tenebrosa*. Not identified.

VOL. VII.

P. 1598. *Seryda cincta*. Not identified.

P. 1601. *Pseudomya consolata* belongs to the genus *Læmocharis*.

P. 1602. *Pseudomya desperata*. Closely allied to *P. tipulina*, Hübn.

P. 1602. *Gymnelia bijuncta*. Subsequently described by Walker as *G. consociata*.

P. 1603. *Gymnelia simplex*. A distinct species.

P. 1603. **Gymnelia xanthocera*. A distinct species.

P. 1604. *Isanthrene odyneroides* is a species of *Erruca*.

P. 1606. *Pœcilosoma sperans* belongs to the genus *Marissa*.

P. 1606. *Pœcilosoma insperata* also belongs to the genus *Marissa*.

P. 1607. *Pœcilosoma gaudens* belongs to the genus *Dycladia*.

P. 1608. **Lagaria acuminata*. Redescribed and figured by Schaus in Lep. Am. as *Gartha dalsa*.

P. 1609. *Læmocharis contracta* belongs to the genus *Erruca*.

P. 1610. *Ilipa tenthredoides*. Also in B. M.

P. 1611. *Ilipa scita*=*S. hilaris*, Walk., in B. M.

P. 1613. *Cosmosoma marginatum* is a distinct species.

P. 1615. **Eurata transiens*=*Dycladia lucetius*, Cr.

P. 1617. **Eunomia vacillans* is a good species.

P. 1617. **Eunomia abdominalis*=*Corematura chrysogastra*, Perty.

P. 1618. *Eunomia separata*. Not identified.

P. 1619. *Pseudosphex consobrina*. Also in B. M.

P. 1619. *Pseudosphex cognata*=*Ps. fasciolata*, Butl., in B. M.

P. 1620. *Myrmecopsis opaca*=*Ps. vespa*, H.-S., fig. 426.

Vol. VII. (*continued*).

P. 1627. *Calonota perspicua.* A distinct species.
P. 1628. *Calonota interrupta.* Allied to the preceding.
P. 1629. **Pampa acuminata.* Redescribed and figured by Schaus in Lep. Am. as *Sychesia hartmanni.*
P. 1629. *Pampa fusiformis*=*Scepsis trifasciata*, Butl., in B. M.
P. 1634. **Automolis angulosa*=*A. flavicinctus*, H.-S.
P. 1635. *Automolis saturata.* Figured by Felder in the 'Reise d. Novara,' t. cii. f. 5, as *A. prætexta.*
P. 1635. *Automolis basalis.* A distinct species.
P. 1636. **Automolis chrysomelas*=*A. geometrica*, Feld.
P. 1636. **Automolis leucomela.* Figured in the 'Biologia Centr.-Amer.' by Druce as *Pterygopterus superba.*
P. 1638. **Automolis reducta*=*Sutonocrea incertus*, H.-S.
P. 1638. *Eucerea rhodophila.* A distinct species.
P. 1639. **Eucerea latifascia*=*E. archias*, Stoll.
P. 1639. *Eucerea mitigata*=*E. reticulata*, Butl., in B. M.
P. 1640. **Eucerea albiceps.* Gen. nov., allied to *Pseudapistosia*, Mösch.
P. 1640. **Eucerea discolor.* A very distinct species.
P. 1644. *Consoprium divisum.* Also in B. M.
P. 1645. **Josia mitis.* Also in B. M.
P. 1647. **Scea puella.* Belongs to the *Chrysauginæ*, and was described by Warren as *Semniomima albiapicalis.*
P. 1647. *Scea infans.* A good species.
P. 1648. *Ephialtias simplex*=*E. abrupta*, Hübn.
P. 1649. *Leucopsumis guttipalpis.* A distinct species.
P. 1650. *Corydalla cryptoleuca.* A distinct species.
P. 1651. *Euagra discalis.* A distinct species.
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P. 1273. **Letis integra*=*Letis cortex* ♂, Gn. The type of *L. integra* is now in the B. M.
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P. 1714. **Dianthœcia eros*. Also in B. M.
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P. 1790. **Gonodonta ditissima*. A good species.
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P. 1799. **Homoptera separabilis* belongs to the genus *Campometra*.
P. 1799. **Homoptera hadenoides* belongs to the genus *Nœnia*.
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P. 1800. *Homoptera indecidens* belongs to the genus *Homopyralis*
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P. 80. **Hypena acclinalis*=*Hypena anicina*, Druce, Biol. Centr.-Amer., Het. i. p. 434 (tab. xxxv. fig. 13).
P. 81. **Hypena mœstalis* belongs to the genus *Rejectaria*, Gn., and is allied to *R. cocytalis*, Gn.
P. 81. **Hypena hastatalis.* Subsequently described by Walker as *Crymona receptalis*, Trans. Ent. Soc. Lond. 3rd ser. i. p. 117. The species will stand as *Crymona hastatalis.*
P. 186. **Bocana orionalis* = *Simplicia tibialis*, Felder, 'Reise d. Novara,' t. cxx. fig. 43.
P. 190. *Ipnea erebusalis* belongs to the genus *Ceromacra*, Gn., of the *Focillinæ.*
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P. 251. *Galanda hebrusalis.* A good species belonging to the Hypenidæ.

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P. 443. *Cataclysta phœdralis* belongs to the genus *Ambia.*

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P. 513. **Phakellura eumeusalis* belongs to the genus *Sestia.*
P. 522. *Margaronia argealis*=*M. aquarialis*, Led. MS., in B. M.
P. 523. *Margaronia ianthealis* belongs to the genus *Sozoa*, Walk., and was redescribed by Walker as *Sozoa costalis*, Cat. Lep. Het. B. M. vol. xxxiv. p. 1373.
P. 523. **Margaronia hypheusalis.* A good species.
P. 536. *Chromodes armeniacalis.* A good species.
P. 593. *Botys mnemusalis.* Not identified.

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P. 595. **Botys nerissalis* belongs to the genus *Phlyctænia*, and is allied to *P. cuneifera*, Warr., in B. M.

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P. 597. **Botys remusalis* = *Anarmodia inscriptalis*, Gn.

P. 600. *Botys pyrrhusalis*. Not identified.

P. 601. **Botys chlorisalis* belongs to the genus *Pantographa*, Led.

P. 602. **Botys melitealis* = *Blepharomastix colubralis*, Gn.

P. 609. **Botys quirinalis* = *Sylepta pactolalis*, Gn.

P. 610. *Botys thalloalis* = *Allactostigma inguinalis*, Gn.

P. 610. **Botys peranthusalis* = *Eulepte concordalis*, Gn., in B. M.

P. 611. *Botys niavialis*. Not identified.

P. 615. *Botys elathealis* belongs to the genus *Cœlorhyncidia*, Hamps., *Hydrocampinæ*.

P. 615. **Botys sylvialis* = *Hyalorista myopicalis*, Led.

P. 617. **Botys agenoralis* = *Microthyris prolongalis*, Gn.

P. 617. *Botys damonalis* belongs to the genus *Sylepta*.

P. 618. *Botys pandaralis* belongs to the genus *Cœlorhyncidia*.

P. 622. **Botys evippealis* belongs to the genus *Syllepis*.

P. 623. *Botys persiusalis* = *Phostria confluentalis*, Warr., in B. M.

P. 626. *Botys asiusalis* = *romalis*, Druce, belongs to the genus *Massepha*, Walk.

P. 627. **Botys odiusalis* belongs to the genus *Sylepta*.

P. 627. **Botys pieralis* = *Azochis gripusalis*, Walk. vol. xviii. p. 542.

P. 628. **Botys turnusalis* = *Prœnesta scyllalis*, Walk. vol. xviii. p. 565.

P. 629. **Botys claudiusalis* belongs to the genus *Calamachrous*.

P. 631. **Botys sabalis* = *Hedylepta vulgalis*, Gn.

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P. 835. **Nachaba congrualis*. A distinct species of the *Chrysauginæ*.

P. 835. *Nachaba oppositalis*. A distinct species of the *Chrysauginæ*.

P. 836. **Licha undilinealis* = *Leucania cicatrix*, Feld. Reise d. Nov. t. cix. fig. 8.

P. 837. *Lancia phrontisalis*. Not identified.

P. 838. *Pterhemia otusalis* = *P. uncinalis*, Hübn.

P. 839. **Lascoria phormisalis* belongs to the genus *Tortricodes*, and is figured in Biol. Centr.-Amer., Het. i. t. 38. figs. 14, 15.

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P. 841. **Hypena xenaresalis*. A distinct species.

P. 842. *Hypena lyrcusalis*. A distinct species.

P. 842. **Hypena lysoalis* = *H. exoletalis*, Gn.

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P. 847. *Hormisa abeluxalis*=*Phurys basilans*, Gn.
P. 850. **Langasa perillalis*. A good genus and species.
P. 851. **Hydara biconalis*=*Psaliodes paleata*, Gn., a Geometrid.
P. 857. **Herminia mœonalis*. A very distinct species belonging to a new genus.
P. 857. **Herminia apisalis* belongs to the genus *Palthis*.
P. 858. **Herminia asteralis*=*Palthis aspisalis*, Walk.
P. 859. *Hermina baresalis*=*Mastygophorus epitusalis*, Walk. vol. xvi. p. 150.
P. 862. **Bleptina metopealis*=*B. confusalis*, Gn.
P. 863. *Bleptina pollesalis*. Apparently a faded specimen of *B. confusalis*, Gn.
P. 863. **Bleptina bogusalis* belongs to the genus *Heterogramma*, Gn.
P. 864. **Bleptina opiteralis*=*Tortricodes phormisalis*, Walk.
P. 864. **Bleptina oppialis*=*Heterogramma endorealis*, Gn.
P. 865. **Bleptina bizialis*=*Palthis agroteralis*, Gn.
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P. 866. **Bleptina cœpioalis*=*Het. bogusalis*, Walk.
P. 867. **Bleptina fadusalis*=also *Het. bogusalis*, Walk.
P. 868. *Bleptina ophelasalis*=*B. styrusalis*, Walk. p. 866.
P. 868. **Bleptina ceusalis*=*Het. bogusalis* Walk.
P. 869. *Bleptina abarusalis*. Not a *Bleptina*. Near the genus *Catada*.
P. 869. *Bleptina stalemusalis*. A distinct species.
P. 870. **Bleptina pagasusalis*. A distinct species.
P. 870. **Bleptina bogesalis*=*B. confusalis*, Gn.
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P. 880. **Renia* ? *decelusalis*=*Bleptina pagasusalis*, Walk.
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P. 881. **Renia* ? *borgesalis* belongs to the genus *Megachyta*.
P. 885. *Megatomis euphrionalis*. A good species.
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P. 893. *Pyralis thiastoralis* belongs to the genus *Rhodoneura*.
P. 894. *Pyralis ninniusalis* belongs to the genus *Hypolamprus* of fam. Thyrididæ.
P. 894. *Pyralis* ? *byzesalis*. Not identified.
P. 896. **Pyralis*? *atialis* belongs to the Tineidæ, genus *Tortricomorpha*=*varipes* and *vescatilis*, Walk.
P. 923. **Rhodaria probalis*=*Hæmatia panopealis*, Walk.
P. 927. *Desmia pisusalis*=*reconditalis* and *minualis*, Walk., belongs to the genus *Diathrausta*.
P. 928. **Desmia bulisalis*=*D. ufeus*, Cr.
P. 928. *Desmia nerinalis* belongs to the genus *Diathrausta*.
P. 936. **Samea calonalis* belongs to the genus *Sciorista*.

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P. 937. **Samea luccusalis*=*S. ecclesialis*, Gn.
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P. 948. *Lineodes peridialis*. Not identified.
P. 949. **Hydrophysa adiantialis*. A good species.
P. 949. *Hydrophysa cæpiosalis* belongs to the genus *Parthenodes*, Gn.
P. 950. *Oligostigma scuthesalis* belongs to the genus *Aulacodes*, and is the same as *A. psyllalis*, Gn.
P. 951. **Oligostigma iasusalis*. A distinct species.
P. 952. *Cataclysta æglesalis*. A distinct species.
P. 952. **Cataclysta cæsoalis*. A distinct species.
P. 953. **Cataclysta œalis*. A distinct species.
P. 954. **Cymoriza œtalis*. *Nymphula lotialis*, Feld., 'Reise d. Novara,' t. cxxxv. fig. 4.
P. 955. *Cymoriza bocusalis*. A good species.
P. 955. *Cymoriza badiusalis* belongs to the genus *Nymphula*.
P. 956. **Cymoriza narcissusalis* belongs to the genus *Musotima*.
P. 956. *Cymoriza abrotalis*. A distinct species.
P. 957. *Cymoriza bolusalis*=*C. damescalis*, Gn., in B. M.
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P. 966. *Zebronia cœliusalis*. Not identified.
P. 967. **Zebronia bunusalis*=*Aripana levinia*, Cr.
P. 968. *Zebronia*? *bialis*. Not identified.
P. 969. *Zebronia*? *abronalis*=*Platytes pusillalis*, Hübn.
P. 984. **Botys tytiusalis* belongs to the genus *Isosalbia*.
P. 985. **Botys autoclesalis* belongs to the genus *Notaspis*, Led.
P. 985. **Botys azionalis*=*Dolichosticha cochrusalis*, Walk. p. 959.
P. 986. **Botys dimichealis* belongs to the genus *Tegostoma*.
P. 986. **Botys graviusalis*=*Samea paolinalis*, Warr., in B. M.
P. 987. *Botys imbrexalis* belongs to the genus *Ceratoclasis*, Led.
P. 987. **Botys nocmonalis*=*Phlyctænia nerissalis*, Walk. vol. xviii. p. 595.
P. 988. *Botys acilialis*. Not identified.
P. 988. **Botys gelliasalis*=*Steniodes lutealis*, Snell., in B. M.
P. 1000. **Ebulia*? *ialis* belongs to the genus *Hapalia*.
P. 1011. **Pionea cæmaroalis* belongs to the genus *Tholeria*.
P. 1012. *Pionea ademonalis*. A distinct species.
P. 1019. **Illice batialis*. A Lithosid; also in B. M.
P. 1020. *Davara azonaxsalis*. A *Phycyta*.
P. 1021. **Dantona busalis*=*N. discerpta*, Walk. This is a Noctuid, and will stand as *Dantona discerpta*, Walk.
P. 1022. **Motya abscusalis*. A good species.

Geometridæ.

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P. 45. **Clysia absconditaria*=Rio form of *C. tasima*, Cr.

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P. 52. **Oxydia noctuitaria* = *O. vitiligata*, Feld.
P. 61. *Chœrodes assyllusaria*. Not identified.
P. 62. **Mucronodes oricusaria* = *Oxydia trychiata*, Gn.
P. 64. **Oxydia alpiscaria* = *Oxydia apidania*, Cr.
P. 64. *Oxydia cariaria*. A distinct species.
P. 79. **Drepanodes agronaria*. A distinct species.
P. 94. **Gynopteryx telysaria* = *G. rhombaria* ♀, Gn.
P. 109. **Apicia rhumata* = *A. lintearia*, Gn.
P. 109. *Apicia nazadaria*. A distinct species.
P. 110. **Apicia uxiaria* = *Gynopteryx seriaria* ♂, Gn.
P. 110. **Apicia alphiusaria*. A distinct species.
P. 111. **Apicia*? *gaumaria* = *Drepanodes hamulata*, Gn.
P. 147. **Nematocampa varicata*. A good species.
P. 171. **Caberodes carcearia* = *C. fundaria*, Gn.
P. 194. **Azelina asilasaria* = *A. denticulata*, Butl.
P. 195. *Azelina amyclaria*. Not identified.
P. 220. **Urapteryx palindiaria* = *Æschropteryx onustaria*, Hübn.
P. 222. **Chœrodes contemnaria* = *Certima muscistrigata*, Gn.
P. 223. *Oxydia nerisaria*. A distinct species.
P. 225. **Drepanodes arnataria* = *D. pholata*, Gn.
P. 225. **Drepanodes excavaria*. A distinct species.
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P. 226. **Drepanodes grata*. A distinct species.
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P. 229. **Pyrinia mephasaria*. A distinct species.
P. 230. **Pyrinia alcandraria*. A distinct species.
P. 234. **Apicia œpaliusaria* = *A. spinetaria* ♂, Gn.
P. 235. **Apicia significaria* = *Renodes brevipalpis*, Gn.
P. 236. *Apicia incrassata*. Not identified.
P. 236. **Apicia extimaria*. A Boarmid of the gen. *Ectropis*, Hübn.
P. 237. **Apicia atillaria* = *Renodes brevipalpis*, Gn.
P. 238. *Apicia molusaria*. Not identified.
P. 238. **Apicia anseraria* belongs to the genus *Drepanodes*.
P. 239. **Apicia inficitaria* = *Apicia asopia*, Druce.
P. 240. *Epione allutiusaria*. Not identified.
P. 240. *Epione ardysaria*. Not identified.
P. 241. **Epione mitranaria*. A distinct species.
P. 241. **Epione relictaria*. A distinct species.
P. 242. **Angerona expulsaria* = *Alana transitaria*, Gn.
P. 246. **Nematocampa nyparia* belongs to the genus *Ænictes*, Warr.
P. 251. **Caberodes asanderaria*. A distinct species.
P. 245. *Dasmeuda alcimusata*. A distinct species.
P. 254. **Eusenea œniasaria*. In B. M. under the genus *Azelina*.
P. 256. **Azelina fusaria* = *A. stolidata*, Gn.
P. 262. **Halesa œnetusaria* = *H. glauca*, Butl.
P. 268. **Laudosia buddloraria* = *Cirsodes acuminata*, Gn.
P. 269. **Bassania amethystata*. A good species.
P. 275. *Berambe gallaria*. Not identified.

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P. 296. **Meticulodes xylochromaria* = *M. xylinaria*, Gn.
P. 354. *Boarmia contraria* belongs to the genus *Euctenectropis*.
P. 354. **Boarmia vacillaria* = *B. vacillaria*, Gn.
P. 357. *Boarmia mollearia*. A distinct species.
P. 357. **Boarmia detractaria* = *Tephrosia dimidiaria*, Gn.
P. 358. **Boarmia guttularia* = *Bryoptera leprosata*, Gn.
P. 359. *Boarmia defimaria* belongs to the genus *Euctenectropis*.
P. 360. **Boarmia delinquaria*. A distinct species.
P. 361. **Boarmia larentiata* = *Pterocypha umbrinata*, Gn.
P. 362. **Boarmia denticularia* = *Tephrosia hyberniaria*, Gn.
P. 363. *Boarmia consimilaria*. A distinct species.
P. 363. *Boarmia locupletaria* belongs to the genus *Pterocypha*.
P. 363. *Boarmia stigmaria*. Not identified.
P. 411. **Tephrosia incongruaria* = *Bryoptera leprosata*, Gn.
P. 412. **Tephrosia ineffectaria* = *Tephrosia responsaria*, Walk.
P. 424. **Paraphia macariata* = *Semiothisa pernicata*, Gn.
P. 425. *Paraphia epioneata*. A distinct species.
P. 482. *Gazena divulsa*. A distinct species.

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P. 503. **Achlora veniliata* = *Cambogia insignata*, Walk.
P. 503. **Achlora catenularia*. A distinct species.
P. 512. *Geometra basiplaga*. A distinct species.
P. 583. **Racheospila marginiplaga* = *R. ocellata*, Cr.
P. 583. **Racheospila satisfacta*. A distinct species.
P. 593. *Thalera distracta*. A distinct species.
P. 662. *Hyria subtectata*. Not identified.
P. 732. **Acidalia obliviaria*. A distinct species.
P. 742. *Acidalia justata*. Not identified.

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P. 788. **Acidalia indecretaria* = *A. obliviaria*, Walk.
P. 788. **Acidalia responsaria*. A distinct species.
P. 789. **Acidalia suffusaria* = *Certima muscistrigata*, Gn.
P. 799. *Timandra viridiplaga*. A distinct species.
P. 827. **Ratiaria argentilinea* = *Urapteryx platinata*, Gn.
P. 828. *Ratiaria metaxantha*. Not identified.
P. 839. **Erosia leucospilaria*. A distinct species.
P. 839. **Erosia semilaria* belongs to the genus *Schidax*.
P. 841. **Erosia lacerataria*. A distinct species.
P. 844. *Erosia distincta* belongs to the genus *Psaliodes*.
P. 845. **Erosia subsignaria*. A distinct species.
P. 859. **Paloda dentifera* = *Erosia acutangularia*, Walk.
P. 910. **Macaria subitaria* = *Semiothisa triplicaria*, H.-S.
P. 911. *Macaria mandata*. A distinct species.
P. 912. **Macaria concisaria*. A distinct species.
P. 913. **Macaria percisaria* = *Semiothisa gambaria*, Hübn.
P. 915. **Macaria continuaria* = *Semiothisa pernicata*, Gn.
P. 919. **Macaria externaria* = *S. pernicata*, Gn.
P. 919. **Macaria fractaria* = *S. nervata*, Gn.

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P. 1069. *Aspilates perlineata*. A distinct species.
P. 1081. *Alydda lignosata*. Not identified.
P. 1100. *Gustiana subflexata* is a Deltoid.
P. 1264. *Thera perarcuata*. A distinct species.

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P. 1310. **Coremia lateraria* = *C. fringillata*, Gn.
P. 1338. **Phibalapteryx mediata* = *Plemyria fluviata* ♀, Hübn.
P. 1339. **Phibalapteryx intrusata* = *P. fluviata* ♂, Hübn.
P. 1351. *Scotosia nitidulata* = *Gazena divulsa*, Walk.
P. 1369. **Pterocypha divulsata* = *P. floccosaria* ♀, Walk.
P. 1370. **Pterocypha celerata*. A distinct species.
P. 1396. **Cidaria perspicuata* = *C. emberizata*, Gn.
P. 1396. **Cidaria patulata*. A distinct species.
P. 1397. *Cidaria eductata* = *C. emberizata*, Gn.
P. 1397. **Cidaria intercalata*. A distinct species.

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P. 1486. *Lagyra*? *dentilineata*. Not identified.
P. 1490. *Pyrinia reflectaria*. A distinct species.
P. 1491. *Pyrinia concisata*. A distinct species.
P. 1492. *Pyrinia subaurata*. A distinct species.
P. 1493. *Pyrinia saturata*. A distinct species.
P. 1493. *Pyrinia radiolata*. Not identified.
P. 1499. **Rumia defixata* = *S. deprivata*, Gn.
P. 1502. *Hyperetis tessellata*. A distinct species.
P. 1502. **Hyperetis quadrilineata* = *Semiothisa contorta*, Druce.
P. 1505. *Endropia*? *subapicata*. Not identified.
P. 1515. *Tetracio inæquaria*. An *Apicia* allied to *cayennaria*, Gn.
P. 1533. **Boarmia perspectata* = *B. vacillaria*, Gn.
P. 1534. **Boarmia subapicata* = *B. syrniaria*, Gn.
P. 1534. *Boarmia tenerata* is the ♂ of *B. mollearia*, Walk.
P. 1553. *Cariprœa mendaciaria*. Not identified.
P. 1560. **Thalassodes glauculata*. A distinct species.
P. 1578. **Anisodes congruaria*. A distinct species.
P. 1579. *Anisodes fimbripedata*. Not identified.
P. 1579. **Anisodes ordinata* = *directata* = *A. urcearia*, Gn.?
P. 1587. *Hyria gavisata*. A distinct species.
P. 1587. *Cambogia albopunctata*. A distinct species.
P. 1599. *Acidalia calidata*. Not identified.
P. 1600. **Acidalia tepidata*. A distinct species.
P. 1600. *Acidalia indignaria* = *Cambogia marcearia*, Gn., in B. M.
P. 1626. *Erosia integrata*. A distinct species.
P. 1627. *Erosia subtruncata*. Not identified.
P. 1627. **Erosia quadruncata* = *Phyllodonta caninata*, Gn.
P. 1628. **Erosia subpatulata* = *Epiplema incolorata*, Gn.
P. 1629. *Erosia bipartaria*. Not identified.
P. 1633. *Carmala flexata*. Not identified.
P. 1636. **Arcobara micromiata* = *Pigia tergeminaria*, H.-S.

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P. 1643. *Macaria vitriferaria*. A distinct species.
P. 1657. *Tephrina signataria*. A distinct species.
P. 1658. **Tephrina responsaria*. A distinct species.
P. 1659. **Tephrina albipunctata*. A distinct species.
P. 1687. *Cadyanda lugens*=*Calospila posthumaria*, H.-S.
P. 1690. **Budara conversata*. A distinct species.
P. 1702. *Larentia inquinata*=*Hammaptera perturbata*, Wlk., ♂.
P. 1710. **Lobophora bifiliferata* belongs to the genus *Nola*.
P. 1718. *Phibalapteryx erosiata*. Not identified.
P. 1723. **Scotosia spilotata*=*Homopyralis indecidens*, Walk.
P. 1730. *Cidaria effrenata*. Not identified.
P. 1737. *Eubolia vicaria*. Not identified.
P. 1754. **Cambogia porphyrinata*. A distinct species.
P. 1755. *Cambogia turbata*. A distinct species.
P. 1755. *Acidalia illiturata*. Not identified.
P. 1756. *Acidalia isographata*. A distinct species.
P. 1757. **Erosia niveinotata* belongs to genus *Dagassa*.
P. 1759. *Stegania quadrinotata*. A distinct species.

Supplement.

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P. 21. *Cotœna mediana*. A distinct species and good genus.
P. 142. *Gerra hyelosioides*=*Gonora heliconiata*, Walk.
P. 257. **Aucula josioides* belongs to the Agaristidæ.
P. 304. *Elysius signatus*. A distinct species.
P. 317. **Addua inclusa*=*Pericopsis parnassioides*, Walk.

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P. 339. **Eloria canescens* belongs to the genus *Hyalospila*.
P. 382. **Compsa saturata*=*Tarchon trilunula*, H.-S.
P. 411. **Notodonta scitipennis*=*N. stragula*, Grote.
P. 439. **Parathyris ennomoides* belongs to the genus *Olceclostera*.
P. 441. **Gopha mixtipennis*. A distinct species.
P. 442. **Blera cerruroides*. A good species.
P. 442. **Rifargia xylinoides*. A good species.
P. 442. **Nagidusa xylocampoides*. A good species.
P. 442. *Luca herbida*. Allied to *Heterocampa*.
P. 442. **Phastia basalis*. A good species.
P. 487. *Limacodes concolor*. Not identified.
P. 491. *Athrula saturnioides*=*Rolepa delineata*, Walk.
P. 516. *Siculodes annuligera*. A distinct species.
P. 517. *Vadata macropterana*. A distinct species; the species figured under this name in the 'Biologia Centr.-Amer.' is a new species.
P. 545. **Sosxetra grata*. A Noctuid.
P. 579. **Cistissa expansa*=*Megalopyge fuscescens*, Walk.
P. 579. **Batatara fusifascia*=*Hylesia approximans*, Walk.
P. 681. *Perigea adornata*. Not identified.

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P. 731. **Hadena subapicalis*=*Heterochroma eriopioides*, Gn.
P. 780. *Azamora basiplaga*=*Az. tortriciformis*, Walk.
P. 798. **Xanthoptera alboflava*. A distinct species.
P. 811. **Callopistria vittata*=*Oligia subobliqua*, Walk.
P. 814. **Penicillaria areusa* belongs to the genus *Ingura*.
P. 852. **Hemiceras illucens*=*H. barina*, Gn.
P. 861. **Gonitis reversa*=*G. exaggerata*, Gn.
P. 866. *Coruncala latipennis*. Not identified.
P. 877. *Homoptera discalis*=*Platydia mollealis*, Walk.
P. 877. *Homoptera gratiosa*. Not identified.
P. 878. **Homoptera punctilinea*. A distinct species.
P. 883. **Homoptera privata*=*H. exhausta*, Gn.
P. 883. *Homoptera phœleuca*. Not identified.
P. 884. **Homoptera parvula*. A good species.
P. 915. *Carthara albicosta*. Not identified.
P. 998. **Phurys partita* belongs to the genus *Capnodes*.
P. 1026. *Thyridospila compta*. Not identified.
P. 1027. **Thyridospila quadriocellata*. New genus.
P. 1028. *Thyridospila amœna*=*Mulelocha calligramma*, Hübn.
P. 1037. **Thermesia absumens*=*Euthermesia inexacta*, Walk.
P. 1048. **Thermesia caliginosa*=*Mulelocha exsiccata*, Walk.
P. 1049. *Thermesia brevistriga*. Not identified.
P. 1051. *Thermesia divulgata*. Not identified.
P. 1052. *Thermesia subfixa* belongs to the genus *Renodes*, Gn.
P. 1053. *Thermesia conficita*. Not identified.
P. 1053. *Thermesia inficita*. Not identified.
P. 1068. *Selenis stipata*=*S. humeralis*, Walk.
P. 1073. *Capnodes basalis*=*Bleptina proliferalis*, Walk.
P. 1073. *Capnodes schizospila*. A distinct species.
P. 1074. **Capnodes concinnula*. A distinct species.
P. 1075. *Capnodes mundicola* is near the genus *Dagassa*.
P. 1079. *Ctypansa obtusa*. Not identified.
P. 1081. *Hypernaria rudis*. Not identified.
P. 1087. **Hypernaria chlorospila*=*H. discessura*, Wlk.
P. 1088. **Hypernaria leucospila*=*Thermesia gemmatalis*, Hübn.
P. 1091. *Hypernaria punctulosa*. Not identified.
P. 1100. *Elixoia subocellata*. Not identified.

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P. 1129. *Gaala dispunctalis*=*Gustiana subflexata*, Walk.
P. 1132. **Hypena bisignalis*. A distinct species.
P. 1132. **Hypena pyralalis*=*Psaliodes paleata*, Gn.
P. 1134. **Hypena disseptalis*=*H. ancara*, Druce.
P. 1135. **Hypena dissutalis*=*H. scabra*, Fabr.
P. 1145. **Boana semialba*. A distinct species.
P. 1158. **Herminia inostentalis*=*Megachyta borgesalis*, Walk.
P. 1158. *Herminia figuralis*=*Gustiana subflexata*, Walk.
P. 1160. **Bleptina responsalis*=*Palthis aspisalis*, Walk.
P. 1160. **Bleptina penicillalis* belongs to the genus *Mastygophorus*.

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P. 1161. **Bleptina diruptalis* = *Megachyta borgesalis*, Walk.
P. 1167. *Bertula excelsalis* belongs to the genus *Mastygophorus*.
P. 1174. **Gizama anticalis* = *Renia deceleusalis*, Walk.
P. 1180. **Bononia niveilinea* = *Licha undilinealis*, Walk.
P. 1180. **Crymona receptalis* = *H. hastalalis*, Walk.
P. 1181. *Bolica armata*. A distinct species.
P. 1181. **Sorygaza didymata*. A distinct species.
P. 1191. *Orocala distentalis*. Near the genus *Notarcha*.
P. 1192. **Alicarda vexatilis* = *A. atialis*, Walk.
P. 1199. **Tibracana xanthialis*. A distinct species.
P. 1224. *Maguza albiguttalis* = *Pastona rudis*, Walk.
P. 1225. *Pyralis intermedialis* = *Hypsopygia sodalis*, Walk.
P. 1225. **Pyralis externalis* = *Hedylepta antenoralis*, Walk.
P. 1225. **Pyralis varipes* = *Alicarda atialis*, Walk.
P. 1232. *Pyralis crassipes* is the ♀ of *Tosale pyralidoides*, Walk.
P. 1262. **Zarania cossalis* = *Ethnistis munitalis*, Led.
P. 1283. **Rhodaria directalis* = *Hyalorista tæniolalis*, Gn.
P. 1303. **Samea obliteralis* = *Sameodes nicæusalis*, Walk.
P. 1331. *Oligostigma amœnalis* belongs to the genus *Glaphyria*.
P. 1331. *Oligostigma exhibitalis*. A distinct species.
P. 1354. *Glyphodes rutilalis* = *G. suavis*, Feld.
P. 1361. *Margaronia auricostalis* = *M. argealis*, Walk.
P. 1390. **Botys additalis* = *Acharana phœopteralis*, Gn.
P. 1390. **Botys ineffectalis* = *Blephoramastix colubralis*, Gn.
P. 1400. **Botys fuliginalis* = *Stenomeles agavealis*, Walk.
P. 1400. **Botys cellatalis* = *Acharana phœopteralis*, Gn.
P. 1466. **Scopula permixtalis* belongs to the genus *Phlyctænia*.
P. 1492. *Bouchis scoparioides* belongs to the genus *Ethnistis*.
P. 1497. **Scoparia stupidalis* = *Illice batialis*, Walk., of the family Lithosiidæ.

VOL. XXXV.

P. 1543. *Pyrinia xantharia* belongs to the genus *Capnodes*.
P. 1549. **Azelina immundaria* = *A. stuposaria*, Gn.
P. 1639. *Ceronaba cinctaria* = *Molybdophora concinnaria*, H.-S.
P. 1702. *Lephana tetraphorella* belongs to the Noctuidæ. Type in B. M.
P. 1743. *Gabalæca bilineatella* belongs to the genus *Erupa*. Type in B. M.
P. 1769. *Zolca congruella* belongs to the genus *Erupa*. Type in B. M.
P. 1783. *Pandemis securiferana*. Type in B. M.
P. 1800. *Torda metamelana* = *Tosale pyralidoides*, Walk. Type in B. M.
P. 1958. *Celæna canifimbria* belongs to the Noctuidæ. Type in B. M.
P. 1963. *Acontia quadrata*. Type lost.
P. 1971. *Thyridospila cæca*. Type lost.

The remaining references are to species described in the Transactions of the Entomological Society for 1862:—

P. 76. **Cingilia humeralis* = *Caterva catenaria*, Cr.

P. 79. *Heterocampa thyatiroides*. Not identified.
P. 82. *Miresa divergens*=*Lithacodes fasciola*, H.-S.
P. 90. *Gora æqualis*. Not identified.
P. 94. *Erysthia obliquata* (locality doubtful). Not identified.
P. 95. *Cottobara concinna*. A Notodont.
P. 95. *Gaphara sobria*. Allied to *Celæna tetera*.
P. 97. **Nænia signiplena* belongs to the genus *Pœsula*.
P. 101. **Asthana erecta*=*Pœsula transversaria*, Walk.
P. 101. **Asthana directa* belongs to the genus *Pœsula*.
P. 102. *Baniana inæqualis*. A distinct species.
P. 103. *Gammace magniplaga*. Not identified.
P. 104. **Remigia consistens*=*Renodes brevipalpis*, Gn.
P. 104. *Gangra atripustula* belongs to the Thermesiidæ.
P. 105. *Focilla abrupta* belongs to the Thermesiidæ.
P. 108. **Marthama conspersa*=*M. squamivaria*, Walk.
P. 109. **Hypena murina*=*H. exoletalis*, Gn., in B. M.
P. 115. **Bocana marginalis*=*B. orionalis* ♂, Walk.
P. 122. *Salbia varialis* belongs to the genus *Phostria*. In B. M.
P. 122. *Asopia depressalis*. Not identified.
P. 124. *Cataclysta insulalis*. A distinct species.
P. 126. *Scopula desistalis* belongs to the genus *Ebulea*.
P. 127. *Scoparia fascialis*=*Hapalia illibalis*, Hübn.
P. 259. *Hadena opima*. Not identified.
P. 260. *Poaphila plagiata*. Not identified.
P. 260. *Poaphila figurata*. Not identified.
P. 260. *Phurys mensurata*. Not identified.
P. 260. **Hypena scissilinea* belongs to the genus *Saserna* and is well figured in the Biol. Centr.-Amer.
P. 271. *Rhagonis bicolor*. Not identified.
P 277. **Pœcilocampa plurilinea*=*Tolype opalina*, Walk.

4. Further Contributions to our Knowledge of the Bornean *Lycænidæ*. By Hamilton H. Druce, F.Z.S., F.E.S.

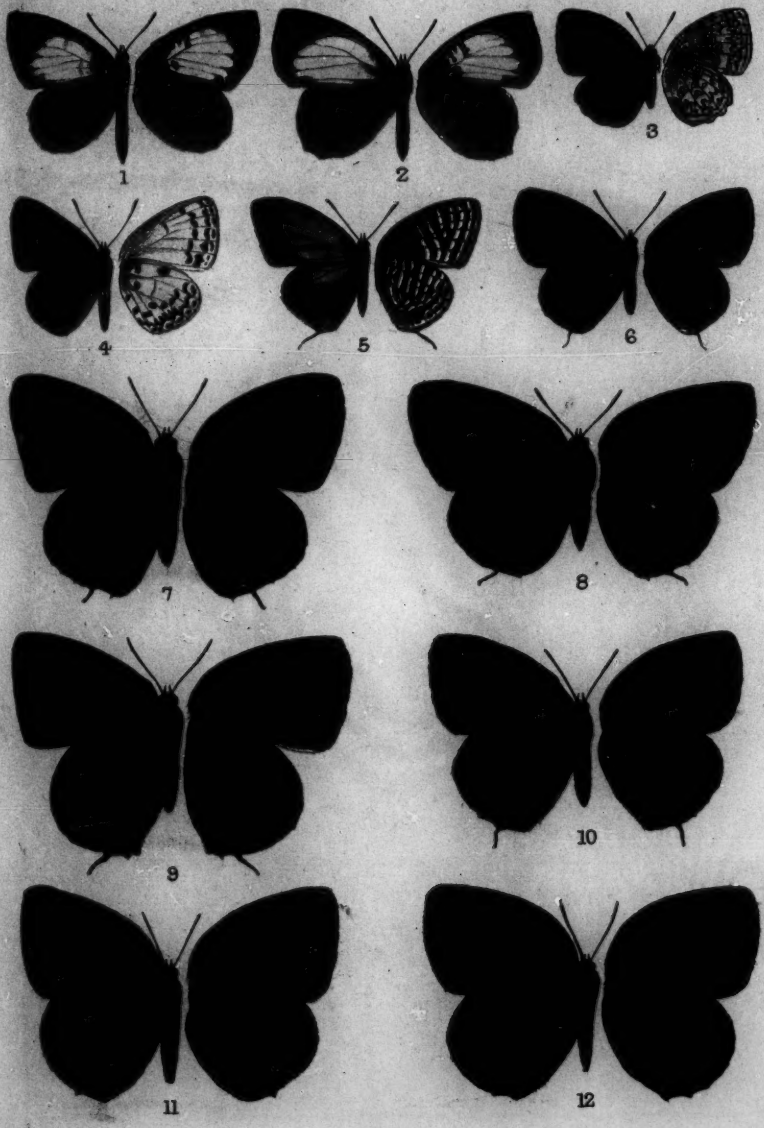
[Received June 15, 1896.]

(Plates XXIX.–XXXI.)

Since June last year, when I had the honour of bringing before the Society a paper[1] dealing with this family of Butterflies, a large amount of fresh material has come to hand.

Dr. Staudinger has received many more specimens from his collector Waterstradt, and Mr. D. Cator has placed in my hands for examination a number of specimens captured by himself and procured from collectors in the island. Amongst these I have found several of considerable interest, which are now recorded here for the first time. Mr. Cator writes me that the places at which he captured specimens are:—Segalind and Sapagaya, which are rivers falling into different parts of Sandakan Bay; Melikop

[1] See P. Z. S. 1895, p. 556.



W.Purkiss lith. West, Newman imp.

Bornean Lycænidæ.

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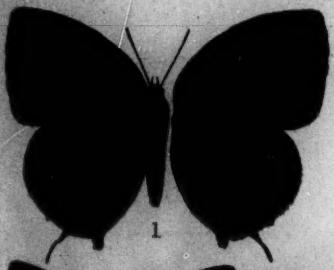

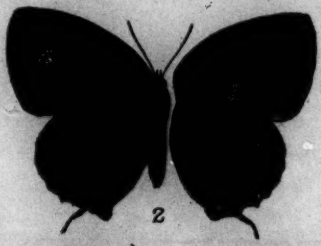

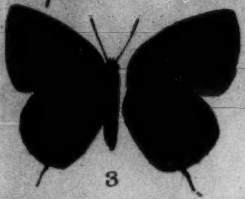

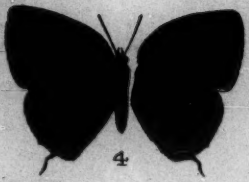

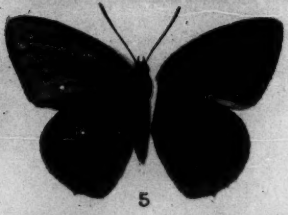

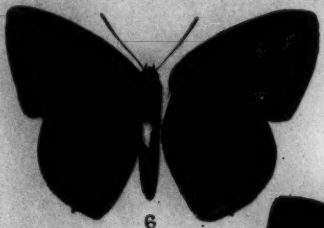

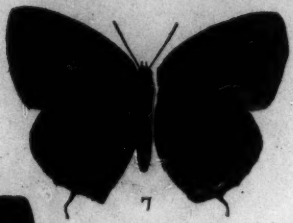

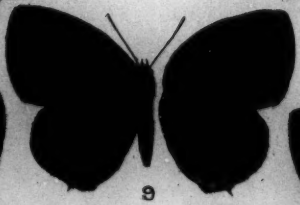

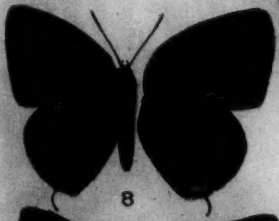

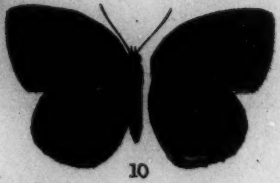

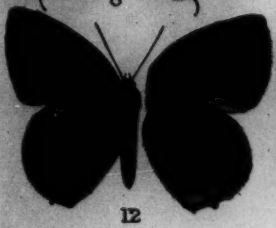

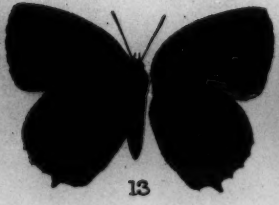

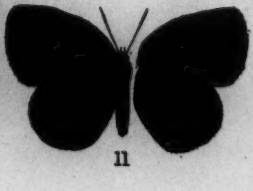

W.Purkiss lith.

West, Newman imp.

Bornean Lycænidæ.

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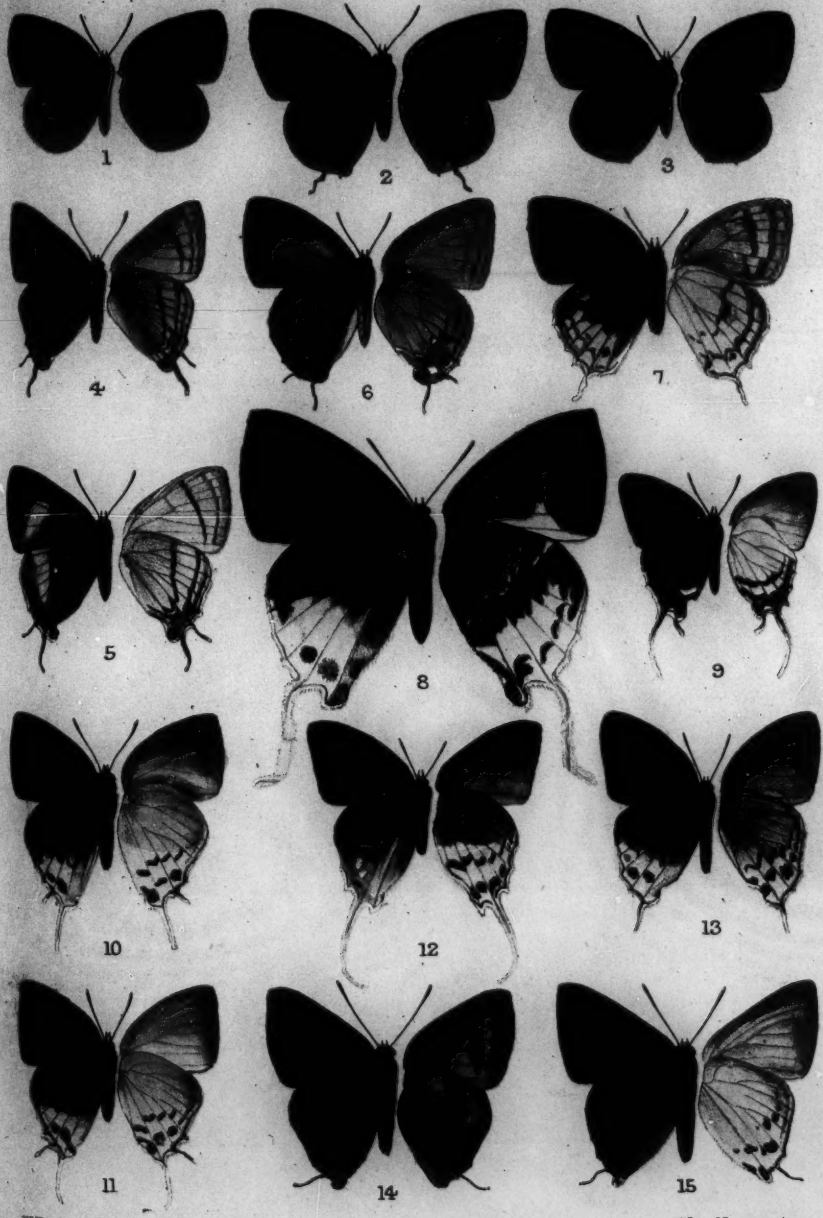

W. Purkiss lith. West, Newman imp.

Bornean Lycænidæ

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(=Penungah) and Tanganak and Banguey, all three small islands a few miles off the coast belonging to the British North Borneo Company.

Some 42 species are now recorded here for the first time from Borneo, a list of which will be found below. 19 of these are described as new.

List of Species not recorded from Borneo in P. Z. S. 1895.

Those marked * are described as new.

*Gerydus improbus, *H. H. Druce.*
Logania malayica, *Distant.*
Hypochrysops œlisparsus, *Butler.*
Zarona jasoda, *de Nicév.*
Simiskina solyma, *de Nicév.*
Cyaniris cameneæ, *de Nicév.*
* „ sonchus, *H. H. Druce.*
Nacaduba hermus, *Feld.*
„ noreia, *Feld.*
*Lampides daones, *H. H. Druce.*
*Arhopala tameanga, *Bethune-Baker.*
„ meander, *Boisd.*
* „ semperi, *Bethune-Baker.*
* „ dajagaka, *Bethune-Baker.*
* „ drucei, *Bethune-Baker.*
„ vihara, *Feld.*
„ pseudomuta, *Staud.*
* „ kounga, *Bethune-Baker.*
* „ bella, *Bethune-Baker.*
* „ havilandi, *Bethune-Baker.*
„ diardi, *Hew.*
„ morphina, *Distant.*
*Arhopala borneensis, *Bethune-Baker.*
* „ labuana, *Bethune-Baker.*
* „ waterstradti, *Bethune-Baker.*
* „ moorei, *Bethune-Baker.*
* „ deva, *Bethune-Baker.*
* „ sandakani, *Bethune-Baker.*
Acesina, sp. ?
Curetis insularis, *Horsf.*
Tajuria blanka, *de Nicév.*
* „ berenis, *H. H. Druce.*
Charana mandarinus, *Hew.*
*Mantoides licinius, *H. H. Druce.*
Thrix gama, *Distant.*
Marmessus boisduvali, *Moore*, var. atra, nov.
Lehera anna, *H. H. Druce.*
Deudorix diara, *Swinhoe.*
* „ strephanus, *H. H. Druce.*
Rapala suffusa, *Moore.*
„ abnormis, *Elwes.*
Virachola smilis, *Hew.*

The two following species from adjacent localities are also described as new :—

Paragerydus melos, from Cagayan.
Tajuria dacia, from Java.

Gerydus, Boisd.

Gerydus improbus, sp. n. (Plate XXIX. figs. 1 ♂, 2 ♀.)

♂. Allied to *G. innocens*, mihi. Upperside: fore wing with the white area more extensive over the cell and with the usual swollen median nervule; hind wing wholly black. Underside: colour and markings much like *G. innocens*, but with a large reddish-brown patch on outer margin of the fore wing about the middle and also in a similar position on the hind wing, where it decreases in intensity inwardly.

♀. Upperside differs only from the male in the white area of the fore wing being slightly more extensive, and in the hind wing being paler. Underside: ground-colour paler than in male, with the reddish-brown patches brighter and more conspicuous. Cilia in both sexes reddish brown on both surfaces, but more conspicuous in the female.

Expanse, ♂ ♀, $1\frac{1}{10}$ inch.

Kina Balu (*Waterstr.*). Type Mus. Staud.

This species appears to be quite distinct, and the black hind wings above and the reddish-brown patches below should at once separate it from its allies [1].

Paragerydus, Distant.

Paragerydus pyxus.

Paragerydus pyxus, de Nicév. J. A. S. B. vol. lxiii. no. 1, p. 27, pl. v. fig. 2, ♂ (1894).

Labuan (*Wahnes*); Sandakan, Sapagaya, and Melikop (*Cator*).

Dr. Staudinger has sent me several specimens which appear to be referable to this species, and Mr. D. Cator has also captured it.

Paragerydus waterstradti, H. H. Druce.

Mr. Cator captured this species at Sapagaya.

Mr. Cator has also obtained a long series of specimens of an allied species from the island of Cagayan, which I believe is unnamed and have ventured to describe below [2].

Paragerydus aphocha.

Allotinus aphocha, Kheil, Rhop. Ins. Nias, p. 28, pl. v. fig. 30 (1884).

[1] Mr. de Nicéville is mistaken in supposing that the *Miletus zymna*, Doubl. & Hew., is a true *Gerydus* (see J. A. S. B. lxiv. p. 445, 1895), as the structure of the legs at once proves that it is not congeneric. Dr. F. Karsch has lately placed this species, together with another from W. Africa (*M. metaleucus*, Karsch), in the genus *Megalopalpus*, Röber (Berlin. entom. Zeits. 1893, p. 217). We possess specimens of *M. zymna*, and on examination I find that they agree with the figures given by Herr Röber so far as the legs and palpi are concerned, but that the neuration does not exactly correspond with the neuration as there figured. I, however, still hold the same opinion as I expressed in P. Z. S. 1895, p. 561, footnote. On the other hand, Mr. Grose Smith has recorded *Miletus zymna*, Doubl. & Hew., from Sumatra, but Mr. de Nicéville and Dr. Martin did not obtain specimens. There is some confusion with regard to *Megalopalpus*, which I regret I cannot clear up.

An examination of the types of *Gerydus boisduvalii*, Butler (Ann. Mag. Nat. Hist. ser. 5, vol. xiii. 1884, p. 194), proves that they are synonymous with *G. leos*, Guér., the female of which is well figured in the 'Voyage de *La Coquille*' (pl. 18. fig. 8, 1829)—the specimens which Dr. Butler referred to *G. leos* being the recently described *G. maximus*, Holland, from Celebes. Of course, *G. boisduvalii*, Butler, could not in any case stand, as Mr. Moore, so long ago as 1857, described another species under the name *boisduvali*, with which the Amboinese species is strictly congeneric.

[2] Paragerydus melos, sp. n.

Closely allied to *P. horsfieldi*.

♂. Upperside much darker brown, with the discal patch paler and more conspicuous; underside pale grey, with the marginal rows of spots in each wing dark and distinct.

♀. Dark brown above, very slightly paler on the disc of the fore wing; underside as male, but ground-colour paler. The outer margin of the hind wing is much more dentate than in that sex of *P. horsfieldi*.

Expanse, ♂ 1$\frac{3}{10}$–1$\frac{4}{10}$ inch, ♀ 1$\frac{4}{10}$–1$\frac{5}{10}$ inch.

Hab. Cagayan. Types Mus. Cator and Druce.

A number of specimens were obtained in June, which vary only in size.

Kina Balu (*Waterstr.*).

Wahnes has also sent several more specimens of this species to Dr. Staudinger.

Allotinus, Feld.

Allotinus subviolaceus, Feld.

Mr. D. Cator captured several specimens at Sandakan in March.

Logania, Distant.

Logania malayica, Distant.

Mr. de Nicéville records this insect from S.E. Borneo (J. A. S. B. vol. lxiii. pt. 2, no. 1, p. 29, 1894); and Mr. D. Cator captured it at Sandakan in January.

Logania regina, Druce.

Melikop and Banguey Is. (*Cator*).

The two specimens obtained by Mr. Cator have less white along the inner margins of the fore wing below than in the type, and thereby approach *L. sriwa*, Distant. They were taken in the month of October.

Logania obscura, Distant & Pryer.

Mr. Cator obtained two females at Sandakan in April which may possibly belong to this species. On the upperside they differ from that sex of *L. staudingeri* in having the disc of the fore wing white, in its base being dusky, in the costal margin being much more narrowly brown, and in the hind wing being dull brown, very slightly dusted with whitish.

In the figure given in P. Z. S. 1895, pl. xxxi., of *L. staudingeri* ♂, the disc of the fore wing appears pure white; this is incorrect, it should be pale greyish blue.

Cyaniriodes, de Nicév.

Cyaniriodes libna, Hew. (Plate XXIX. fig. 3, ♂.)

Mr. Cator has kindly lent me the specimen described in P. Z. S. 1895, p. 565, to figure, which is in his collection. He captured it in June 1894, about 8 o'clock in the morning, flying in a cocoanut plantation.

Hypochrysops, Feld.

Hypochrysops cœlisparsus, Butler.

Miletus cœlisparsus, Butl. Ann. Mag. Nat. Hist. ser. 5, vol. xii. p. 159 (1883).

Hypochrysops cœlisparsus, H. H. Druce, Trans. Ent. Soc. 1891, p. 188, pl. x. figs. 10, 11.

Sandakan and Libaran I. (*Cator*).

Mr. Cator was fortunate in capturing two fine specimens of this beautiful species, which is recorded now for the first time from Borneo. They are larger than the type, and differ from it in the band beyond the cell in the fore wing below being somewhat less straight and rather more broken up. But this difference appears to me much too slight to constitute it a distinct species.

ZARONA, de Nicév.

ZARONA JASODA, de Nicév.

Zarona jasoda, de Nicév. J. A. S. B. vol. lvii. pt. 2, p. 280, pl. xiv. fig. 5, ♂ (1888); id. Butt. Ind. etc. p. 34, pl. xxv. fig. 144, ♂ (1890).

Sandakan.

Mr. D. Cator captured a single male specimen in July, which is the only one I have seen from Borneo.

PORITIA, Moore.

PORITIA SUMATRÆ, Feld.

Brunei (*Waterstr.*).

Dr. Staudinger's collector has obtained examples of this species on the mainland. In Sumatra, Mr. de Nicéville states that, with *P. philota*, Hew., it is less rare than the others belonging to the genus.

PORITIA PHALUKE, H. H. Druce.

Mr. D. Cator procured both sexes at Sandakan in April and in August.

SIMISKINA, Distant.

SIMISKINA PHALENA, Hew.

When referring to this species, I placed it in the genus *Poritia*; but as it is without the tuft of hair near the base of the submedian nervure in the hind wing, it is perhaps better placed in *Simiskina*, where it has been included by Mr. de Nicéville. The second tuft of hair in all the specimens I have examined is hardly discernible; and is entirely absent in all specimens of *S. pharyge*, Hew., that I have before me[1].

These facts seem to point to the conclusion that in this case the absence or presence of these tufts is not of generic importance, and that *Simiskina* cannot stand. Mr. de Nicéville has lately described and figured the female of *S. phalena*, Hew. (Journ. Bombay Nat. Hist. Soc. ix. p. 270, pl. O. fig. 13, 1895), so that I appear to have quite incorrectly considered his *S. solyma* to be the female. The general resemblance of the undersides and the receipt of the two sexes from the same locality led me to believe that they belonged to the same species. Mr. D. Cator has sent me for examination two females taken at Sandakan in July.

[1] See also my remarks on *Poritia philura*, mihi, P. Z. S. 1895, p. 569.

SIMISKINA SOLYMA.

Simiskina solyma, de Nicév. J. A. S. B. vol. lxiii. pt. 2, p. 29, pl. iv. fig. 10 (1894).

Labuan (*Waterstr.*).

The female only is known.

NEOPITHECOPS, Distant.

NEOPITHECOPS ZALMORA, Butler.

Mr. de Nicéville states that "*Cupido talmora*, Butler" of Druce, P. Z. S. 1873, p. 348, is a synonym of *N. zalmora* (see J. A. S. B. vol. lxiv. p. 451). The name *talmora* appears to me to be so clearly a misprint that comment is unnecessary.

CYANIRIS, Dalman.

CYANIRIS CAMENÆ.

Cyaniris camenæ, de Nicév. Journ. Bomb. Nat. Hist. Soc. vol. ix. p. 278, pl. O. fig. 22 (♂).

Kina Balu (*Waterstr.*).

C. camenæ is very close to *C. selma*, mihi, but differs in the darker shade of its blue, in the spots on the underside being about equally conspicuous, and in its considerably larger size.

CYANIRIS SONCHUS, sp. n. (Plate XXIX. fig. 4, ♂.)

♂. Allied to *C. cossæa*, de Nicév. Upperside blue, of a darker shade, and with the black margins distinctly wider. Fore wing with a black mark partially closing the cell; hind wing entirely without the white fascia at the apex, and with the costal margin wholly black. Underside creamy white, with the spots arranged as in *C. cossæa*, but more prominent, especially those forming the marginal and submarginal series.

Expanse 1½ inch.

S.E. Borneo (*Wahnes*). Type Mus. Staud.

C. sonchus, together with *C. cossæa*[1], de Nicév., and *C. plauta*[2], mihi, form a small group in the genus, which can be at once distinguished by the yellowish-white ground-colour of the underside.

CYANIRIS PLAUTA, H. H. Druce.

Dr. Staudinger has received a specimen (♂), taken at an altitude of 3000 metres on Kina Balu, in which the white patch on the apex of the hind wing above has almost disappeared, and on the underside the spots are smaller and the ground-colour greyer.

C. plauta usually has a black spot on the costal margin of the hind wing below, over the spot in cell as in *C. cossæa*, but this spot is not always present and in the example figured is absent.

[1] *C. cossæa*, de Nicév. Journ. Bomb. Nat. Hist. Soc. vol. ix. pl. O. figs. 14, 15 (1895).

[2] *C. plauta*, H. H. Druce, P. Z. S. 1895, p. 574, pl. xxxii. figs. 8, 9.

NACADUBA, Moore.

NACADUBA HERMUS, Feld.

Lycæna hermus, Feld. Sitz. Ak. Wiss. Wien, Math.-nat. Cl. xl. p. 457. no. 33 (1860).

Kina Balu (*Waterstr.*).

Mr. de Nicéville has examined Felder's type, and states that *N. viola*, Moore, is a synonym of this species.

NACADUBA NOREIA.

Lycæna noreia, Feld. Verh. zool.-bot. Ges. 1868, p. 282.

Labuan (*Wahnes*).

Dr. Staudinger has received the tailless form of *N. ardates*, Moore, which according to Mr. de Nicéville (he having seen the type of *L. noreia* at Vienna) equals that species.

NACABUBA ALUTA, Druce.

I think it is most probable that the species *N. nanda* described by Mr. de Nicéville in Journ. Bomb. Nat. Hist. Soc. vol. x. p. 34, pl. S. fig. 23 (1895), is the same as *N. aluta*. *N. aluta* has the prominent white anteciliary thread in the three anal interspaces as described by Mr. de Nicéville, but on the underside of the fore wing the anteciliary line only is straight, the other two lines being lunulated, both much to the same extent, the spaces between the lines being darker, as described in *N. nanda*[1].

LAMPIDES DAONES, sp. n. (Plate XXIX. fig. 5, ♂.)

♂. Upperside pale shining silvery blue, appearing of a greenish shade in some lights. Fore wing: costal margin very narrowly, apex and outer margin broadly, dull black. Hind wing dull black, with the blue colour extending just over and around the cell only; inner margin paler; a marginal row of indistinct black lunules edged with sordid white, the one between the lower median nervules being large and distinct, followed by a black anteciliary line. Tail black, tipped with white. Cilia of fore wing dull black, of hind wing sordid white, black at the extremities of the nervules. Underside pale greyish brown, with white lines arranged exactly as in *L. elpis*, Godt., but in the hind wing rather straighter. Thorax and abdomen above and below concolorous with wings. Antennæ black, spotted with white.

Expanse 1½ inches.

Penungah. Mus. Cator and Druce.

On the upperside this butterfly appears to be allied to *L. mara-*

[1] Mr. de Nicéville states, in the list of Sumatran Butterflies, that he thinks *N. perusia*, Felder, is probably a synonym of *N. atrata*, Horsf. This is not so. We possess specimens from Amboyna which I have compared with the type in the Felder collection. On the upperside *N. perusia* is much like *N. atrata*, but on the underside is quite different, the white lines, excepting those at the bases, are further apart, and have the ground-spaces between them white, bordered on each side by a brown line.

kata, de Nicéville[1], but on the underside is quite different and appears to belong to another group. I have not seen *L. marakata*, and can only judge from the description. Mr. Cator captured *L. daones* in December.

LAMPIDES OSIAS, Röber.

Banguey I., N. Borneo (*Waterstr.*).

L. osias certainly occurs in Sumatra, although it is not given by Mr. de Nicéville and Dr. Martin in their list. We possess specimens from the N.E. It is closely allied to *L. suidas*, Feld., of which I have examined the type, but is a paler shade of blue on the upperside, and the white markings of the underside show through more than usual, especially on the hind wing. On the underside the lines of *L. suidas* are broader and straighter.

From some remarks made by Mr. de Nicéville in the Journ. Bomb. Nat. Hist. Soc. vol. x. p. 38 (1895), it is evident that he has not seen the type of *L. cleodus*, Feld., as he writes of it as "azure-blue." It is paler than *L. celeno*, Cr., in fact almost white, shining, and with a slight greenish tinge; and, from some remarks further on, on the same page, I do not feel certain that he has identified *L. osias* correctly.

We possess many specimens of *L. osias*, one of which was identified by Herr Röber.

LAMPIDES LIVIDUS, H. H. Druce.

Kina Balu (*Waterstr.*).

Dr. Staudinger has received a single male specimen of this species, which agrees well with the type from Labuan, but is slightly stronger in colour on both surfaces.

THYSONOTIS, Hübn.

THYSONOTIS SCHAEFFERA, Esch.

We have lately received specimens of this species captured at Sandakan.

ARHOPALA, Boisd.

Mr. G. T. Bethune-Baker, who has been working at this genus for some three years, has prepared the following additional list of Bornean species, and has sent me descriptions of those which he considers to be new, whilst I have added new localities to some few species which I have previously referred to. Mr. Bethune-Baker is entirely responsible for all the new species of this genus here described.—*H. H. D.*

Through the kindness of Mr. H. H. Druce I have recently been enabled to examine several specimens of the genus *Arhopala* which are evidently new, and these, together with a number of others now in my possession, kindly lent me by Dr. Staudinger and Herr Georg Semper, show that there is plenty of work yet to be

[1] *L. marakata*, de Nicév. Butt. Ind. etc. p. 174, footnote (1890).

done in the island of Borneo, for out of quite a small number of the genus there are twelve new species, most of which are strongly marked forms. As I am gradually preparing a monograph of the genus, it will be unnecessary for me now to do more than enumerate and describe the species.—*G. T. B.-B.*

ARHOPALA MEANDER, Boisd. Voy. Astr., Lép. p. 76 (1832).

One very magnificently marked (underside) specimen from the collection of Herr Ribbe from South-east Borneo.

ARHOPALA TAMEANGA, sp. n., Bethune-Baker. (Plate XXIX. figs. 7 ♂, 8 ♀.)

Tameang-Lajang (S.E. Borneo).

Expanse, ♂ 57, ♀ 54 millim.

♂. Upperside: both wings dark bluish purple, in some lights almost indigo colour, and having a brownish patch in a certain light, with an almost linear black costa and outer margin to the primaries, and on the secondaries a broad brown costa and very fine black outer margin; abdominal fold grey; submedian area very densely clothed with brown hairs; tail black, tipped with white, lobe scarcely developed at all. Underside: both wings very warm ochreous brown, with darker spots margined with creamy. Primaries with three very dark, large, slightly increasing cell-spots, below the third being another equally dark rather large spot, over the third a small spot near the costa; subdiscal area dark brown, with a slightly purplish tinge; submedian area pale; transverse branch composed of six oval spots, the first four outwardly oblique, each spot projecting beyond its predecessor, especially the fourth; fifth and sixth spots shifted well inwards and below each other; submarginal band indefinite, but fairly distinct. Secondaries rather darker than primaries, with a dark spot at the basal costal extremity, three dark basal spots below each other, and a fourth shifted right beyond the internal nervure; these are followed by three more spots below each other, the third being very large and irregular; cell closed by a largish spot, below it being another connecting it with the lower of the three spots; transverse band consisting of eight spots, the second being large and shifted outwards on to its outer margin, the third shifted right out, detached, fourth further out, fifth inwards, sixth outwards; seventh angular spot well inwards (not detached), almost broken into two at the angle, and confluent with the long eighth spot; submarginal row very indistinct; anal spot black, with a very plentiful scaling of bright pale greenish metallic scales, with one edged above by a dark line to the internal nervure; this line has some metallic scales therein.

♀. Upperside: both wings pale bluish violet; primaries with broad brown costa, broader outer margin, and very broad apical area, cell closed by a darkish spot; secondaries with very broad margins all round, especially the costa. Underside precisely as in the male, but rather paler, and with the submarginal bands rather

more distinct, whilst the second and third spots of the transverse band of the secondaries are not dislocated.

This is a well-marked species, and will follow *A. agnis*, Feld. A male and female, e mus. Herr G. Semper.

ARHOPALA SEMPERI, sp. n., Bethune-Baker. (Plate XXIX. figs. 9 ♂, 10 ♀.)

♂, Tameang-Lajang (S.E. Borneo); ♀, Kina Balu.

Expanse, ♂ 54, ♀ 50 millim.

♂. Upperside: both wings dull violet; primaries with costa blackish, of medium width, and posterior margin rather broader; cell closed by a distinct, black, curved, narrow spot, and nervures intersecting the surface with black. Secondaries with broad brown costa, rather narrow posterior margin, increasing broadly at the anal angle; abdominal fold grey; nervures darkly intersecting the surface. Tail longish, black, tipped with white; the closing of the cell is slightly darkened. Underside: wings ochreous brown, with darker spots encircled with whitish. Primaries with three large increasing cell-spots, the third vein very irregular and large; below this is another large spot in the lower median angle, above it is a trace of a minute spot on the costa; subdiscal area slightly darker, edged very distinctly with whitish, whilst below the second cell-spot is a light V-shaped mark in this area; transverse band composed of six longish spots, the upper four being distinct ovals, a small one near the costa; the second shifted right outwards, the third a little further out, but, on account of its larger size, its inner margin is shifted inwards also; fourth shifted outwards again, fifth and sixth spot below each other and shifted well inwards; below these is a trace of a small spot below the lower median nervule; submarginal row indefinite and indistinct. Secondaries with a fair-sized spot at the basal extremity of the costa, and four longish basal spots below each other, the upper three being very close together, the fourth shifted right inwards and being in line (horizontally) with the third; following these are three large spots below each other; cell closed by a large irregular spot, below which is a larger spot than usual occupying the lower median angle; transverse band composed of eight spots in pairs; the lower of the first pair is shifted outwards, the second pair is shifted right out and detached, the lower of these two being further out than the upper; the third pair well inwards, the lower of these two being shifted slightly outwards; seventh angular spot shifted right inwards and confluent with the eighth spot, which is unusually long, extending close up to the fourth basal spot; submarginal band distinct, sublunar; lobe-spot black, edged above with blue metallic scales, a black spot on each side the tail, with superimposed blue metallic scales, which are more plentiful on the inner spot.

♀. Upperside: both wings violet; primaries with broad brown costa, broader posterior margin, and very broad apical area; secondaries with broad brown margins all round, diminishing slightly in the anal area. Underside like the male, but paler and

less distinctly spotted, and the transverse band has a longish spot below the lower median nervule; the secondaries are likewise less darkly spotted, especially the transverse band, which is continuous without a break, and with spots more quadrangular.

This is a very distinct species and will come after *A. tameanga*.

♂ e mus. Semper; ♀ e mus. Staudinger.

ARHOPALA DAJAGAKA (Stgr. MS.), sp. n., Bethune-Baker. (Plate XXIX. figs. 11 ♂, 12 ♀.)

Kina Balu, Labuan, Tameang-Lajang.

Expanse, ♂ ♀, 55 to 56 millim.

♂. Upperside: both wings bluish purple, with a very slight brown tinge in side lights. Primaries with costa and outer margin finely black. Secondaries with broad brown costa and narrow black outer margin; abdominal fold grey; no tail, but a slight tooth-like projection at the end of the lower median nervule; no lobe. Underside brown with an ochreous tinge, with dark spots palely encircled. Primaries with three increasing cell-spots, below the first and second a large spot, sometimes divided into two, below the third a spot in the lower median angle; transverse catenulated band composed of six spots—the first, on the costa, small; second, third, and fourth shifted well outwards and outwardly oblique; fifth and sixth below each other, shifted inwards but outwardly oblique; submarginal row indefinite; submedian area paler. Secondaries with a spot at the extreme costal basal extremity; four basal spots of fair size below each other, the second shifted slightly inwards, the fourth right inwards, followed by three more spots below each other; cell closed by a large subovate spot, below which is a smaller one connecting it with the lower of the previous three; catenulated band composed of eight spots, all of which (except the eighth) are completely encircled by a pale margin and are arranged in a fairly even semicircle; the first and second are detached from each other and from the others, all of which touch each other (in one specimen before me I notice the third and fourth spots are not quite completely encircled with a pale margin); submarginal row rather indefinite; anal spot black; a dark spot on each side the lower median nervule, over which are superimposed bright pale blue metallic scales, as also over the anal spot; this scaling is rather plentiful.

♀. Upperside: both wings bright violet. Primaries with a dark patch beyond the apex of the cell; costa not very broadly brown; outer margin with deep scollops of brown between the nervules, apex broadly brown. Secondaries: costa broadly brown, outer margin with brown border of medium width; abdominal fold greyish. Underside as in the male, but paler; but the catenulated band of the primaries has an additional spot below the lower median nervule, and the same band in the secondaries has not the spots so completely palely margined as in the male.

This species will precede *A. anamuta*, Semper.

Mus. Staudinger, Semper, G. T. B.-B.

ARHOPALA DRUCEI, sp. n., Bethune-Baker. (Plate XXX. figs. 1 ♂, 2 ♀.)

Kinu Balu.

Expanse, ♂ 55, ♀ 50 millim.

♂. Upperside: both wings purple, quite dull or somewhat bright according to light; costa and outer margin of primaries narrowly brown; costa of secondaries broadly, outer margin narrowly, brown; tail long, tipped with white, lobe fairly distinct, abdominal margin grey. Underside: both wings ochreous brown, with darker spots palely margined, those before the transverse lines being the darkest. Primaries with three good-sized increasing cell-spots, above and below the third is another spot; subdiscoidal area dark, with an indefinite pale lunular mark in the upper part at the centre; transverse catenulated band composed of six confluent spots, below which is a double spot like the figure 8; the upper four spots are slightly curved outwards, the fifth and sixth have their inner margins shifted well inwards, but the outer margins very slightly so, and these two spots have an outward inclination; submarginal row indefinite but fairly distinct; submedian area paler. Secondaries with a small spot at the basal upper extremity; four basal spots below each other, second shifted slightly inwards, fourth well inwards outside the internal nervure; beyond these are three larger spots below each other; cell closed by a long subquadrate spot, below which is a small spot in the lower median angle; transverse band beginning below the upper discoidal nervule, composed of six laterally-edged spots, the second shifted outwards, third inwards, fourth inclined outwards, fifth angular spot right inwards; sixth long spot very irregular in shape, slightly outwards, but extending up to the internal nervure; just above and between the uppermost spot of this series and that closing the cell are two confluent spots occupying the interspaces between the costal, subcostal, and upper discoidal nervures, the lower of which is the longer of the two; submarginal row indefinite but fairly distinct; anal area occupied by bluish metallic scales over a blackish patch; tail brown, tipped with white; lobe-spot velvety black, edged above with metallic blue.

♀. Upperside: both wings bluish purple, not nearly so deep as in the male, with broad margins all round, the apical area being the broadest. Underside: both wings rather darker than in the male; in the primaries the transverse band has no 8-shaped double spot, but ceases on the lower median nervule. In the secondaries the transverse band just touches the lower of the two spots on the costa, and the three upper spots of the transversal series are nearly (not absolutely) confluent, whilst the fifth and sixth are confluent.

In spite of these little differences, the two insects look so precisely similar in general pattern and tone that I do not doubt their being sexes of the same species, which will come next to *A. adatha*, Hew. There are a male and two females before me, all taken on Kina Balu, and kindly lent to us by Dr. Staudinger.

ARHOPALA VIHARA.

Arhopala vihara, Feld. Wien. ent. Mon. iv. p. 395 (1860); Reise Nov. Lep. ii. p. 228, t. 29. fig. 7 (1865).

Labuan and Tameang-Lajang.

Two typical specimens, e mus. Dr. Staudinger and Herr Semper.

ARHOPALA PSEUDOMUTA, Stgr. Iris, ii. p. 125.

Hab. Malacca; Borneo.

Expanse, ♂ 46, ♀ 47 millim.

♂. Upperside: both wings rather dull violet; primaries with narrow brown costa, and less narrow, but still narrow, black outer margin; secondaries with broad brown costa and narrow outer margin; abdominal fold greyish; tail brown, longish, tipped with white. Underside: both wings warm ochreous brown, with darker spots palely encircled. Primaries with three increasing cell-spots, below the third another in the lower median angle; transverse catenulated band composed of six spots—the first three very oblique outwardly, the fourth inclined (not shifted) inwards so as to form a sharp curve with the lowest of the three, fifth shifted well inwards, sixth inclined outwards; submarginal row rather indefinite; submedian area paler, subdiscal area darker. Secondaries with a small spot at the basal costal extremity; four basal spots, the third shifted slightly outwards, the fourth well inwards, followed by three larger spots below each other; cell closed by a subquadrate spot, below which is a small one touching the lowest of the three; catenulated band composed of eight spots—the second shifted outwards and detatched from the first and the third, third and fourth shifted right outwards, fifth well inwards, sixth outwards, seventh right inwards and detached, confluent with the long eighth spot; submarginal row sublunular and well defined; anal spot velvety black, preceded by two black spots, which are almost covered over with pale blue metallic scales; the anal spot is also edged above by the same coloured scales.

♀. Upperside: both wings pale violet; primaries with rather broad costa, very broad apical area, and broad outer margins, all brown; secondaries with broad brown costa, narrow brown outer margin, increasing slightly towards the anal angle. Underside similar to the male, but much paler, and in the secondaries the fourth spot of the catenulated band is projected more outwards.

A male from North Borneo is decidedly bluer than those from Malacca, and the outer margin of the secondaries is rather wider.

I have thought it well to fully describe this species, as Staudinger's description (Iris, ii. pp. 125 & 126) is almost purely comparative. —*G. T. B.-B.*

ARHOPALA KOUNGA, sp. n., Bethune-Baker. (Plate XXX. figs. 3 ♂, 4 ♀.)

Kina Balu.

Expanse, ♂ 41, ♀ 37 millim.

♂. Upperside: both wings bright rather deep blue tinged with purplish, with a slight brownish lustre in one light; costa and outer margin of primaries very finely black, almost linear; costa of secondaries broadly, outer margin very finely black; abdominal fold greyish; tail fairly long, black tipped with white, lobe slightly developed, with small white spot on its interior and exterior margin. Underside: both wings olivaceous brown, with darker spots palely margined. Primaries a little paler than secondaries, with three increasing cell-spots, above and below the third being another spot; transverse maculate band composed of six spots, the upper four slightly curved outwards and uninterrupted, the fifth shifted slightly inwards, sixth outwards and terminating on the lower median nervule; below this in the pale submedian area is a trace of another small indefinite detached spot; submarginal row rather indefinite and indistinct, subdiscal area dark. Secondaries with four basal spots below each other, the third shifted outwards; following these three larger ones below each other, the third one being again shifted outwards; cell closed by a large subquadrate spot, below which is a smaller triangular one connecting it with the lower of the three spots, whilst above it, touching its outer apex, are two spots over each other, the lower of which is the larger, having its outer margin shifted outwards, the upper one touches the costal nervure; the transverse maculate band commencing on the upper discoidal nervule consists of six spots—the first three almost confluent, but each curved very slightly beyond its predecessor, fourth shifted outwards, fifth angular spot right inwards and just detached, sixth long irregular spot almost confluent with it; submarginal row fairly distinct, sublunular; a black spot on the lobe and on the margin on each side of the tail; anal area covered with bright pale blue metallic scales, over which is a pale dusting up to the inner margin; tail brown, tipped with white.

♀. Upperside: both wings slightly bluer than the male; primaries with broadish costa, broad outer margin, and broader apex of black; cell closed with a very distinct black spot, and the apex of the blue area beyond the cell has three deep black spots in the nervule interspaces: secondaries with broad costa, less broad outer margin of black; abdominal fold greyish; tail black, tipped with white. Underside very much greyer than in the male, and in the secondaries the transverse maculate band just touches the outer lower margin of the two costal spots, and the fourth spot is shifted less outwards.

This species is nearest to *A. aroa*, Hew., but that insect is much more purple on the upperside, and the arrangement of the three upper spots of the transverse band of the secondaries is different, and in the very large series of *A. aroa* now before me I find they follow the same pattern throughout. The female of *A. kounga* is quite different as to upperside and colour of underside, as already described.

Types, e mus. Staudinger.

ARHOPALA BELLA, sp. n., Bethune-Baker. (Plate XXX. figs. 6 ♂, 7 ♀.)

Kina Balu.

Expanse, ♂ 55, ♀ 48 millim.

♂. Upperside: both wings brilliant lustrous purple around the margins, the whole of the inner area being lustrous brown, shading in certain lights into dull rather shining deep violet, somewhat as is seen in violet-coloured specimens of *A. allata*, Stgr., but much more beautiful. The secondaries show much more of the brilliant purple than the primaries and they have the abdominal fold brownish grey. In the single specimen before me there is a trace of a tail broken off, but it appears to have been a fine one. Extreme margins with a very fine lineal black line. Underside: both wings brown, slightly tinged with lilac, with dark spots laterally edged with very pale lilac. Primaries with three large cell-spots, the outer two very large, below the third in the lower median angle is another largish spot, whilst over the third are two very small spots, the lower one being shifted inwards; transverse band composed of six spots, the upper four shifted very oblique each beyond its predecessor, fifth spot shifted well inwards; sixth spot, the largest, ending on the lower median nervule and shifted outwards; a trace of the submarginal row; subdiscoidal area dark, submedian area rather paler. Secondaries with a spot at the extreme basal apex, four basal spots below each other, followed by three large ones; cell closed by a large subquadrangular spot, below which is a small triangular one connecting it with the lower of the three spots just mentioned, this spot being very irregular in shape; above the spot closing the cell and touching it, but shifted outwards, are two spots over each other, reaching the costal nervure, whose inner margins are confluent, but the outer margin of the lower and larger spot is shifted outwards; the transverse macular band begins below the upper discoidal nervure and is composed of six spots—the first one shifted right out, with its upper inner angle just touching the lower and outer extremity of the lower of the two spots above, second spot shifted outwards, third inwards, fourth outwards, fifth angular spot inwards, sixth long spot slightly inwards again; a trace of a submarginal sublunular row; anal area with bluish-green lustrous metallic scales; lobe-spot black; lobe scarcely developed at all.

♀. Upperside: both wings lustrous azure, in certain lights rather dull violet. Primaries with costa somewhat narrowly and outer margin broadly dark brown; the apex of the cell has a short black line at its upper extremity, showing rather plainly in the blue area. Secondaries with all the margins broadly brown; tail fairly long, brown tipped with white. Underside precisely as in the male, but tinged more with pinkish violet than lilac.

This very beautiful and (in the male) very unusual-looking species will probably come near to *A. acestes*, de N., but may at once be recognized by its large size, its brilliant purple margins, and its lustrous brown inner areas; the macular transverse bands are also

somewhat different, and *A. acestes* is much more spotted in appearance beneath than *A. bella*. I have a fine pair of this species before me, both taken on Kina Balu, from Dr. Staudinger's collection.

ARHOPALA HAVILANDI, sp. n., Bethune-Baker. (Plate XXX. figs. 8 ♂, 9 ♀.)

Kina Balu.

Expanse, ♂ ♀, 47–48 millim.

♂. Upperside: both wings brilliant deep purplish blue, in some lights looking dull purplish, whilst with a side light there is quite a brownish lustre over the one side; costa and outer margin of primaries very finely black; secondaries with costa broadly and narrowly black; tail fine, black tipped with white; abdominal fold greyish. Underside: both wings cinnamon-brown, with a pinkish-violet tinge, with darker brown spots very palely margined. Primaries with three good-sized increasing cell-spots—a very small spot being over the second and third close to the costa, and another between and almost touching them (*i. e.* the cell-spots), this spot varies much in size; below the third is a good-sized spot occupying the lower median angle; subdiscoidal cell dark, submedian area paler: the transverse band is composed of seven spots, the upper four being outwardly oblique, the second being shifted well beyond the small first one, the third very slightly inwards, the fourth right outwards, the fifth and sixth almost confluent, shifted well inwards but outwardly inclined, and below this is a smaller eighth spot, which is sometimes indistinct; submarginal row indistinct, sublunular. Secondaries with a small spot at the extreme basal angle of the costa, four basal spots below each other, the second and fourth shifted inwards, followed by three larger ones below each other; cell closed by a large spot laterally edged; transverse band beginning below the upper discoidal nervule and composed of six spots—the second shifted outwards, third inwards, fourth outwards, fifth angular spot quite detached and shifted far inwards and confluent with the long bottle-necked sixth spot; touching the outer margin of the spot closing the cell and the inner margin of the first spot of the transverse band are two spots confluent over each other, the upper one reaching the costa and the lower one as described but with its inner margin shifted right inwards, and being therefore the larger of the two; the submarginal row is sublunular and indistinct; anal area black, with bright bluish superimposed metallic scales; lobe-spot small, black; lobe scarcely developed at all.

♀. Upperside: both wings brilliant, lustrous azure-blue, dull violet in some lights and with the peculiar brown lustre in others. Primaries with somewhat narrow costa, broad outer margin, and very broad dark brown apical area; at the margin of the blue patch beyond the upper apex of the cell are three or four deep black spots in the interspaces of the nervules. Secondaries with all the margins broadly dark brown; the outer margin being less broad

than the others; tail fine, brown tipped with white. Underside precisely as the male, but a little duller in colour.

I have two males and two females before me, all from Kina Balu; they are nearest to *A. aida*, de Nicév., but can at once be recognized by their much larger size and very different upperside—the black margins being linear and blue, quite different in colour. I have two specimens of *A. aida* before me from Labuan, which are about half as small again as my species.

ARHOPALA AIDA, de Nicév. Journ. Bombay Nat. Hist. Soc. vol. iv. p. 168, pl. A. fig. 1 (1889).

Two specimens from Labuan—a male like the type, and a female small and violet-coloured.

ARHOPALA DIARDI, Hew. Cat. Lycænid. B. M. p. 9, figs. 51, 52 (1862).

Two ordinary specimens from Labuan and S.E. Borneo, from the collections of Dr. Staudinger and Herr Ribbe respectively.

ARHOPALA MORPHINA, Dist.

Panchala morphina, Distant, Ann. Mag. Nat. Hist. ser. 5, vol. xiv. p. 201 (1884).

One specimen of this lovely insect, taken at Labuan, from Dr. Staudinger's collection.

ARHOPALA BORNEENSIS, sp. n., Bethune-Baker. (Plate XXX. fig. 5, ♂.)

Borneo (Kina Balu, Tameang-Lajang); Malacca.

Expanse, ♂ 42 to 46 millim.

♂. Upperside: both wings brilliant lustrous green, not so brassy as *A. aurea*, Hew., having in a side light a bluish tinge, with linear brown costa and outer margin to the primaries: secondaries with the green only occupying the central part of the wing, the rest of the wing being brown, this colour invading the outer margin of the green area, so as to make it irregularly hollowed; the tail at the end of the lower median nervule is short. Underside: both wings dirty dull brown, all the markings being most indistinct, the pattern being slightly darker, with very faint pale edgings. Primaries with a trace of three increasing cell-spots, followed by an equally indistinct transverse band composed of five spots, the upper three being outwardly strongly oblique, the lower two inwardly oblique; there is a trace of a spot below that closing the cell; subdiscal area dark; submedian area pale. Secondaries with spots rather more distinct, four basal below each other, followed by three larger ones below each other; cell closed by a largish spot, below which is a small one in the lower median angle, and above it, almost confluent but shifted very slightly outwards, are two spots above each other, the upper smaller one reaching to the costa: transverse band less distinct, composed of six spots from the upper discoidal nervure; the third

is shifted slightly inwards, fourth outwards, fifth angular spot inwards and confluent with the eighth spot; submarginal row very indistinct; two or three dark spots at the anal area superimposed by unusually blue submetallic scales.

This species will come between *A. trogon*, Dist., and *A. aurea*, Hew.; it is nearest to the latter in the underside colour, but to the former in the pattern. I have one specimen before me from S.E. Borneo in which the pattern is much more distinct than in the other two from Kina Balu and Malacca.

ARHOPALA LABUANA, sp. n., Bethune-Baker. (Plate XXX. figs. 12 ♂, 13 ♀.)

Labuan; Mindanao.

Expanse, ♂ 49, ♀ 44 millim.

♂. Upperside: both wings dark bluish purple, in some lights very dull violet, and with a side light having that lustrous brown gloss which appears not uncommon in the Bornean *Arhopalæ*; primaries with narrow black costa and rather broader outer margin; secondaries with broad brown costa and narrow blackish scolloped outer margins; abdominal fold greyish. The lower median nervule is produced into a longish tooth-like projection; but after having carefully examined it, I do not think it has ever been a tail. Underside: both wings greyish ochreous brown, with distinct dark spots and fascia edged with cream-colour. Primaries with three increasing cell-spots, below the third are two spots in the nervule interspaces, that touching the third spot being exceedingly small; transverse maculate band composed of six subovate spots, that on the costa being very small, the upper four are arched slightly outwards, the fifth inclined slightly inwards, and the sixth, ending on the lower submedian nervule, inclined outwards; submarginal row indefinite, but distinct; submedian area greyish; subdiscal dark, with a pale linear edging. Secondaries with four fair-sized spots below each other, the third shifted slightly outwards, beyond these are four larger spots similarly arranged; cell closed by a large subquadrate spot, below which are two other spots in the nervule interspaces, the upper of these being minute and discernible by its pale outer margin, the lower touches the third spot of the second row of four: transverse maculate band composed of seven spots—a pair (one above the other) on the costa, the lower one being the larger, which touches the spot closing the cell; the third spot is shifted right outwards, its inner margin just touching the outer margin of the second spot; fourth spot shifted very slightly outwards but inwardly oblique; fifth spot well inwards, sixth well outwards; seventh angular spot well inwards and terminating just beyond the submedian nervure; submarginal crescentic row distinct, with its inner pale margin distinct from the costa to the internal nervure; three black spots at the anal area, with pale blue metallic scales over them, these having a sharp lunular black interior edging, which follows the line of the pale inner margin of the submarginal row.

♀. Upperside: both wings bright violet-blue; primaries with a dark spot at the end of the cell and exceedingly broad brown margins all round; costa brown to the cell, and almost to the upper median nervule; secondaries with exceedingly broad costa and very broad outer and abdominal margins. Underside exactly like the male, but darker in colour.

This species will precede *A. arsenius*, Feld.

ARHOPALA WATERSTRADTI, sp. n., Bethune-Baker. (Plate XXX. figs. 10 ♂, 11 ♀.)

Kina Balu.

Expanse, ♂ 42, ♀ 40 millim.

♂. Upperside: both wings lustrous bright blue tinged with violet, in some lights the colour being dark violet-blue; primaries with costa narrowly, and outer margin less narrowly black; secondaries with costa less broadly than usual, and outer margin very narrowly black. Underside brown, with slightly darker spots palely edged. Primaries with pattern rather indistinct, with three increasing cell-spots, the first near the base, below the second is an indistinct and indefinite spot, and below the third is a small indistinct one: transverse catenulated band composed of six spots, ending on the lower median nervule; the upper four are each inclined obliquely outwards, but not fractured; the fifth is shifted inwards very slightly as to its outer, but more so as to its inner margin; the fifth is shifted outwards; submarginal band very indistinct; submedian area paler. Secondaries with pattern more distinct than in primaries; four basal spots below each other, the third shifted outwards, followed by three larger spots below each other; cell closed by a subquadrate spot, below which is a small spot in the lower median angle: transverse catenulated band composed of eight spots from the costal nervure; the second largish, shifted well outwards and slightly dislocated from the third, which is shifted right outwards; fourth shifted outwards again; fifth inwards, and having a very oval exterior margin; sixth outwards, with a straight margin; seventh angular spot dislocated right inwards, eighth slightly inwards; submarginal row fairly distinct; anal area darker, with superimposed pale bluish-green metallic scales.

♀. Upperside: both wings bright lustrous azure; primaries with rather broad costa and very broad black outer margins; secondaries with broad even black margins all round; abdominal fold greyish. Underside just like the male, with two exceptions, viz., that there is a trace of a spot on the costa over the third cell-spot in the primaries, and in the secondaries the second and third spots of the transverse band are not dislocated. All the other markings are exactly the same in every particular.

This species will follow *A. metamuta*, Hew., but it can easily be distinguished by both wings being the same colour.

Types, e mus. Staudinger.

ARHOPALA MOOREI, sp. n., Bethune-Baker. (Plate XXXI. fig. 1 ♂.)

Labuan; Kina Balu; Malacca.

♂. Upperside: both wings bright purplish blue, rather deep in tone; primaries with very narrow black costa and broad black outer margins; secondaries with broad black borders of almost equal width all round; abdominal fold dark grey; no tail. Underside: both wings dirty brown, with very slightly darker spots palely edged. Primaries with all the markings very obscure; three increasing cell-spots, the third the most obscure, with a trace of a small one below: transverse catenulated band composed of five spots, the first on the discoidal nervure, the upper three are very oblique outwardly, the fourth is shifted decidedly inwards, and the fifth outwards; submarginal row exceedingly indistinct; submedian area pale. Secondaries with pattern distinct; four basal spots, the second and fourth shifted inwards, followed by three larger spots below each other, the two lower ones being near together; cell closed by a large spot, below which is another small one: transverse catenulated band composed of eight spots, the upper two distinct from the others but not disconnected, the second spot is shifted well outwards, the third right out again, the fourth rather further out still, fifth inwards, small, sixth outwards; seventh angular spot right inwards (sometimes dislocated), eighth almost confluent with it; submarginal band indefinite; anal area with two dark spots, over which are imposed bluish or bluish-green metallic scales.

♀. Upperside: both wings of paler blue than the male, with short broad black costa, very broad outer margin, and excessively broad apical area; secondaries with very broad black borders all round, the costa being the broadest. Underside precisely as the male in every respect.

This species, with *A. waterstradti*, will come between *A. metamuta*, Hew., and *A. hypomuta*, Hew. It can readily be distinguished from the former in that the colour of both the wings is the same without the purple gloss, and darker altogether than the colour of the hind wings of that species; the borders are also narrower than in *A. metamuta*; whilst the bluer colour and the broad borders separate it from *A. hypomuta*. From *A. waterstradti* it differs in being a smaller insect with broader borders and of a deeper and more purple-blue. I have two specimens, kindly lent me by Herr Ribbe, from Malacca, which, though larger than Bornean specimens, yet cannot be referred to anything but this insect.

Mus. Staudinger, Ribbe, G. T. B.-B.

[We also possess two males of this species from Sumatra.—*H. H. D.*]

ARHOPALA DEVA, sp. n., Bethune-Baker. (Plate XXX. fig. 3, ♂.)

N. Borneo, Sandakan.

Expanse, ♂ 40, ♀ 40 millim.

♂. Upperside: both wings purple, with black linear costa and

very fine outer margin in the primaries; in the secondaries the costa is broadly brown, the outer margin very narrowly black; abdominal fold dark grey; no tail. Underside: both wings dull ochreous brown, with spots slightly darker, palely edged. Primaries with three small increasing cell-spots, below the third a small spot, and a trace of a spot above on the costa: transverse maculate band composed of five distinct spots, beginning below the third subcostal nervule; the second spot is shifted inwards and the third outwards, these first three all being outwardly oblique; fourth spot shifted well inwards and being almost dislocated; fifth spot inclined outwards and ending above the lower median nervule; submarginal row indistinct and indefinite; submedian and subdiscal area greyish. Secondaries with pattern rather plainer than in the primaries; four basal spots below each other, the third shifted outwards, followed by three somewhat larger spots below each other; cell closed by a subovate spot, below which is a small triangular one: transverse maculate band composed of eight spots, the first six being distinct spots, the second shifted outwards, third outwards, fourth outwards again, fifth well inwards, sixth outwards, seventh angular spot dislocated right inwards, eighth long spot almost confluent with this; submarginal row more distinct than in primaries; lobe-spot black, and a trace of a black spot in each of the next two nervule interspaces, over which are imposed bright greenish-blue scales.

♀. Upperside: both wings brown, slightly tinged with purple; primaries with a patch of violet over the cell, the subdiscal area, and half of the median area; secondaries with the violet almost confined to the cell. Underside exactly like the male, but with the pattern slightly more distinct.

This is nearest to *A. antimuta*, Feld. (*davisoni*, de Nicév.), but is a larger insect and purpler in colour, whilst beneath the colour is different and the transverse maculate bands are differently arranged, as described. In the female the violet patch is of quite a different colour and occupies less space in the primaries, and in the secondaries there is not a quarter so much as in *A. antimuta*. Its correct position will be between *A. hypomuta*, Hew., and *A. antimuta*, Feld.

A male from N. Borneo (*H. G. Smith*); female from Sandakan (*G. J. B.-B.*).

Female also in Mus. Druce, from Sandakan.

Arhopala elopura, H. H. Druce. (Plate XXIX. fig. 6, ♂.)

I have figured the type male. [We have recently received a male from Sandakan.—*H. H. D.*]

Arhopala sandakani, n. sp. (Plate XXXI. fig. 2, ♂.)

Sandakan; Java.

Expanse, ♂ 35–45, ♀ 42 millim.

♂. Upperside: both wings bright bluish purple, rather dull in

some lights, with a very narrow black costa and broader outer margin to the primaries; secondaries with a very broad costa and much narrower outer margins; tail black with white tips; anal angle with a small whitish spot. Underside: both wings ochreous, with darker spots margined with cream-colour. Primaries with the usual three increasing cell-spots; above and below the third is another spot, that on the costa being quite small; subdiscal area dark: transverse band composed of six or seven spots, the second one larger than that on the costa and shifted outwards, third very slightly outwards but inclined decidedly inwards, fourth both shifted and inclined outwards, fifth perpendicularly inclined with inner margin shifted inwards, sixth shifted well outwards; a trace of a small spot below this; submarginal row fairly distinct; submedian area pale. Secondaries with a small spot at the costal basal extremity; four basal spots, second and fourth shifted inwards, followed by three larger spots below each other, the second of which is shifted inwards; cell closed by a subquadrate spot, below which is another connecting it with the lowest of the three spots: transverse band composed of seven spots, the upper two being detached from the others and just touching the cell-spot, the third spot is shifted right outwards, fourth outwards again, fifth with its inner margin only shifted inwards, sixth well outwards, seventh angular, and eighth spot confluent, being joined by a narrow neck and extending to nearly halfway up the internal nervure; submarginal row distinct, subannular; a black spot on the very ill-developed lobe and just beyond the tail, the intervening area filled with metallic green scales, which also edge the spots above.

♀. Upperside: both wings purplish blue, with a black spot at the end of the cell in the primaries, the costa being broadly blackish, the outer margin broader, and the apical area still broader. Secondaries with very broad margins all round, the costa being the broadest, and the outer margin slightly decreasing in width near the tail. Underside as in the male.

This species will come near to *A. vihari*, Feld. I have before me three males—one from Java, in which the spots are very dark indeed; but in none of these, though evidently the same species, is the transverse band of the primaries precisely similar: in that from Java the upper four spots are strongly but evenly outwardly oblique; whilst in a very small specimen from Sandakan the first five make an almost even curve, and in one wing of the male type there is a minute spot almost touching the inner upper corner of that closing the cell.

E mus. Druce (Sandakan, 2 ♂, 1 ♀). ♂, Java, e mus. Staudinger.

ARHOPALA CENTAURUS, Fabr.

Kina Balu (*Waterstr.*).

Dr. Staudinger has received a single female specimen of the form *pseudocentaurus*, D. & Hew.

ARHOPALA APIDANUS, Cr.

Banguey I., N. Borneo (*Waterstr.*).
Waterstradt has also sent this species from the Island of Balabac.

ARHOPALA FARQUHARI, Distant.

Kina Balu (*Waterstr.*).

ACESINA, Moore.

Dr. Staudinger has sent me a single specimen of this genus from Kina Balu, which is in poor condition, and which I am unable to refer to any named species with certainty. On the upperside it is much like the figure given by Mr. Elwes of *A. ariel*, Doherty[1], in P. Z. S. 1892, pl. xliv. fig. 9, but on the underside appears quite different.

CURETIS, Hübn.

CURETIS TAGALICA, Feld.

Banguey I. (*Waterstr.*).
The specimen obtained from this island is more like the typical specimens than those from the mainland.

CURETIS ÆSOPUS, Fab.

Labuan (*Wahnes*); Sarawak (*Platen*).
I have received specimens of this form in which the basal brown area on the hind wing has entirely disappeared.

CURETIS INSULARIS, Horsf.

Phœdra insularis, Horsf. Cat. Lep. E. I. C. p. 125 (1829).
Kina Balu (*Waterstr.*).
Dr. Staudinger has sent a male which agrees exactly with Javan specimens in our collection.
C. insularis appears to be a smaller and slighter built insect than its congeners.

PRATAPA, Moore.

PRATAPA CALCULIS, H. H. Druce.

Possibly this is the same as *Camena cretheus*, de Nicév. Journ. Bomb. Nat. Hist. Soc. vol. ix. p. 294, pl. P. fig. 35 (1895), but the linear band on the fore wing below appears much more bent outwards than in *P. calculis*; but there appear to be no other differences.

TAJURIA, Moore.

TAJURIA JALINDRA, Horsf.

Waterstradt has obtained both sexes of this insect from Kina Balu, and I find that the blue area of the typical Javan form of female is replaced by a smaller white area crossed by brown veins,

[1] *A. ariel*, Doh. J. A. S. B. lx. pt. 2, p. 33 (1891).

much as in *T. indra*, Moore, but has a much larger white area than any females we possess from Continental India.

TAJURIA DOMINUS, H. H. Druce.

This may be the male of *T. isæus*, Hew., Hewitson's male *T. isæus* being in fact *Britomartis cleoboides*, Elwes, as pointed out by Mr. de Nicéville in the Journ. Bomb. Nat. Hist. Soc. vol. ix. p. 307. Dr. Staudinger has sent me a male from Malacca which is very close to *T. dominus*, but has a greener shade of blue on the upperside and the orange at the anal angle below is more yellow. I have also received a female *T. dominus* from Kina Balu, and note that the blue on the upper surface is more shining and that the outer margin of the fore wing is certainly more convex than in the female from Malacca. If Mr. Distant's type male of *T. relata* should prove to be a female, then most probably the male referred to above from Malacca is the male *relata*; but for the present I do not think it is advisable to sink *T. dominus*.

I, however, fail to see how Mr. de Nicéville can form the conclusion, from the possession of a female *T. relata* from Perak that agrees exactly with Hewitson's fig. 14, pl. xix., that "Hewitson was correct in the first instance in calling his original type a male" (*vide* J. B. N. H. S. vol. ix. p. 308).

Mr. de Nicéville has described the genus *Britomartis* as having only two subcostal nervules to the fore wing, and his *B. buto* is also described as having but two; in the figure given of this species (J. B. N. H. S. vol. ix. pl. P. fig. 41), three subcostal nervules are distinctly shown, doubtless in error.

Colonel Swinhoe has lately described *Tajuria valentia*[1], which, according to Mr. de Nicéville, is the same as *Britomartis cleoboides*, as that species is the *T. mantra* of the 'Butterflies of India, etc.'

TAJURIA BLANKA?

Tajuria blanka, de Nicév. J. A. S. B. vol. lxiii. p. 39, pl. iv. fig. 4, ♀ (1894).

Kina Balu (*Waterstr.*).

Dr. Staudinger has sent a fine female specimen which agrees well with Mr. de Nicéville's figure and with his description in all points, excepting as regards the thorax below, which he describes as drab; in the specimen before me it is white. Dr. Staudinger writes that it is certainly the female of *Pratapa lucidus*, mihi. The female of *P. cippus* is, I believe, unknown, so that we cannot judge by analogy; but, despite the different appearance of the underside, I think it is quite possible that Dr. Staudinger is right. Mr. de Nicéville and Dr. Martin record two specimens of *Camena cippus*, Fabr., from Sumatra, but there is no note as to their sex. Can these be specimens of my *P. lucidus*, which certainly occurs in Sumatra? If, as I suspect, these two specimens should turn

[1] *Tajuria valentia*, Swinh. Ann. Mag. Nat. Hist. ser. 6, vol. xvii. p. 358 (1896).

out to be *P. lucidus* and *Tajuria blanka* to be its female, the insect must stand under the latter name, unless *T. blanka* is the female of the true *P. cippus*. But, I think, before we can arrive at a correct conclusion, we must await the arrival of more specimens. I note that the thorax beneath, in all the specimens I have seen of *P. cippus* and *P. lucidus*, is white.

TAJURIA DONATANA, de Nicév.

Kina Balu (*Waterstr.*); Banguey I. (*Waterstr.*).

The specimen obtained on Banguey I. has the blue rather duller and its areas rather reduced.

TAJURIA BERENIS, sp. n. (Plate XXXI. fig. 6, ♂.)

♂. Upperside bright pale blue, colour of *Purlisa giganteus*, Dist., paler on the disc of the fore wing: fore wing—costal margin black; apex broadly black, reaching to just below the lower median nervule, apparently blacker at the end of the cell; inner margin straight; cilia black, except at outer angle where it is greyish: hind wing—costal margin whitish, darker towards the apex, which is narrowly black; anal fold whitish; a black anteciliary line; cilia greyish; lobe with a black spot partially covered with blue scales and crowned with a small red spot. Underside grey, colour of *T. thyia*, de Nicév.[1], indistinct lines closing the cells in both wings as in that species; the ultra-median linear band much as in *T. thyia*, but much bowed outwards in the fore wing and straighter in the hind wing. The anal markings are arranged as in *T. thyia*, but the black spots are larger and the yellow areas darker in colour and more extensive; cilia grey. Head, thorax, and abdomen concolorous with wings on both surfaces. Two tails of about equal length, black, bordered and tipped with white.

Expanse 1⅛ inch. Types Mus. Staud. & Druce.

Kina Balu (*Waterstr.*).

Dr. Staudinger has received two males of this species which are identical. Although I have compared it with *T. thyia*, it is not by any means closely allied to it. The outer margin of the hind wing in *T. thyia* is much straighter, and the wing is much more produced anally than in *T. berenis*.

I thought at first sight that this species might come into Mr. de Nicéville's genus *Ops*[2], as it appears to have a darker black spot at the end of the cell, but on a closer examination I cannot detect that these scales present a different aspect to any others on the wing. I have not seen any species of *Ops* at present.

Below will be found described a beautiful new species of *Tajuria* from Java[3].

[1] *Tajuria thyia*, de Nicév. J. B. N. H. S. vol. vii. p. 336, pl. H. fig. 11 (1892).

[2] *Ops*, de Nicév. id. vol. ix. p. 296 (1895).

[3] TAJURIA DACIA, sp. n. (Plate XXXI. figs. 4 ♂, 5 ♀.)

♂. Upperside rich shining ultramarine blue: fore wing—costal and outer margins and apex broadly deep black, much as in *T. diæus*, Hew.; cilia black,

Suasa, de Nicév.

Suasa libis, Staud.

Suasa suessa, de Nicéville[1], described from the Malay Peninsula, appears to be a close ally of this species, if, indeed, it is distinct, but unfortunately I do not possess specimens for examination.

Chliaria, Moore.

Chliaria skapane, H. H. Druce.

I put this insect at first in the genus *Hypolycæna*, but on further examination I think it is better placed in *Chliaria*.

Chliaria phemis, H. H. Druce.

I find that this species again is better placed in the genus *Chliaria* than in *Hypolycæna*. It is close to *C. amabilis*, de Nicév., but the black spots at the anal angle of the hind wing below are differently placed.

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greyish at outer angle: hind wing—costal margin narrowly greyish from the base to the apex, which is narrowly black; a black anteciliary line; cilia white. The tail on the lower median nervule, linear, black, and tipped with white, that on the submedian nervure about twice as long, black, edged and tipped with white; the lobe dark red, with a black anteciliary line and a small black spot dusted with blue scales. Underside pale grey: fore wing with a broad, even, straight brown band commencing on the 2nd subcostal nervure, rather less than halfway between the end of the cell and the apex, and running obliquely to the lower median nervule, where it becomes somewhat attenuated and reaches the submedian nervure; a submarginal indistinct line darker towards the outer angle, the ground-colour being rather darker between this line and the margin; cilia brown: hind wing with similar bands as described above, the darker one being broken up and angled at the lower median nervure, and running disjointedly to the anal margin; a black spot between the lower median nervules faintly crowned with orange; lobe deep black, bearing towards the submedian nervure a large crescent of bright blue scales; there are also a few blue scales in the submedian interspace close to the lobe; cilia greyish, white towards the anal angle. Head, thorax, and abdomen blackish above clothed with greyish-blue hairs; beneath concolorous with wings; legs grey, with black spots; antennæ black, with reddish-brown tips and white spots.

♂. Upperside violaceous blue, of almost the same shade as *Cyaniris puspa*, Horsf., ♂: fore wing—apex, outer and costal margins black as in male, and with a white spot on the disc beyond the cell, clearest towards the upper median nervule: hind wing—costal margin whitish, grey along the subcostal nervule; outer margin narrowly black, breaking up into spots in the median and submedian interspaces; a large white apical spot, clearest towards the costal margin. Tails and lobe as in male; cilia of both wings white; the dark bands of the underside can be seen through on the upper. Underside differs only from the male in the ground-colour being white; the cilia of both wings are white except towards apex of fore wing, which is brown. There is also a brown anteciliary line to the fore wing, and also to the hind wing, which becomes stronger towards the anal angle.

Expanse, ♂ 1½, ♀ 1⅝ inch.

Gede, W. Java (*Prèlw*). Types Mus. Staud.

This lovely insect is allied to *Tajuria diæus*, Hew., but is quite distinct.

[1] *Suasa suessa*, de Nicév. J. B. N. H. S. vol. vii. p. 337, pl. H. figs. 8, 9 (1892).

CHLIARIA MIMIMA, H. H. Druce.

The specimens I referred to from N.E. Sumatra, P. Z. S. 1895, p. 605, are I think, the *C. tora*, Kheil. *C. mimima* is very close to that species, but besides the less extensive blue area above, there is a slight difference on the underside, the large black spot on the outer margin of the hind wing of *C. tora* being surrounded on all sides except its outer edge with yellow, whilst *C. mimima* has this yellow on its inner and anal sides only. I am inclined to believe that the insect which Mr. de Nicéville has described and figured as the female of *C. tora*, Kheil[1], is not that sex of *C. tora* but of *C. amabilis*, de Nicév.[2]

We possess a female from N.E. Sumatra which on the underside is exactly like that of *C. tora* ♂, and like that possesses a small black spot on the costa of the fore wing and a large and a small black spot on the costa of the hind wing. These spots are distinctly shown in Herr Kheil's figure. On the upperside the fore wing is dull brown, immaculate, and the costal half of the hind wing is of the same colour, the anal half being dull greyish white, with a marginal row of indistinct blackish spots between the nervules increasing in size towards the anal angle, a black anteciliary line inwardly bordered by a narrow white line; cilia white. Tails short as in male.

The very worn female specimen referred to by Mr. de Nicéville (*op. cit.* p. 312), from Borneo, is doubtless that sex of the species I have named *C. phemis*. Dr. Staudinger has sent me a male Javan specimen of *C. amabilis*, which has the tails considerably longer than are shown in Mr. de Nicéville's figure.

CHARANA, de Nicév.

CHARANA MANDARINUS, Hew.

Myrina mandarinus, Hew. Ill. Diurn. Lep., *Lycæn.* p. 28, t. 11. figs. 6, 7 (1863).

Kina Balu (*Waterstr.*).

Dr. Staudinger has received a single female specimen, which differs from any Indian females I have seen by having a greater area of white on the hind wing above and by the yellow on the hind wing below being nearly all replaced by white; the black angular markings and spots towards the anal angle are larger and more prominent, so it may possibly represent a different species, but until the male is discovered it is impossible to be certain.

MANTO, de Nicév.

Manto, de Nicév. Journ. Bomb. Nat. Hist. Soc. vol. ix. p. 312, March 1895.

Pseudomyrina, H. H. Druce, P. Z. S. October 1895.

The name which I proposed must be sunk as a synonym.

[1] *C. tora*, de Nicév. J. B. N. H. S. vol. ix. p. 311, pl. P. fig. 43, ♀ (1895).
[2] *C. amabilis*, de Nicév. id. p. 306, pl. P. fig. 42, ♂ (1895).

Mr. de Nicéville makes *Myrina hypoleuca*, Hew., the type, whilst mine was *Myrina martina*, Hew.

MANTOIDES, gen. nov.

Allied to *Manto*, de Nicév. Fore wing with three subcostal nervules as in that genus; inner margin longer and deeply bowed outwards just before its middle; a large tuft of long hairs attached to the inner margin where it is thus bowed and lying over a patch of differently placed scales. Hind wing with a very large shining patch from the costal margin extending to the lower wall of the cell, bearing upon it a small patch of differently formed, shining scales, placed at the junction of the subcostal nervule.

Type, *Mantoides licinius*.

This genus belongs to the group which has the inner tail the longest. It differs from *Charana* and *Jacoona* in the possession of secondary sexual characters, and from *Manto* in these characters being differently placed—the tuft of hairs being situated on the underside of the inner margin of the fore wing, whilst in that genus it is on the upperside of the hind wing.

MANTOIDES LICINIUS, sp. n. (Plate XXXI. figs. 10 ♂, 11 ♀.)

♂. Upperside: fore wing blackish brown, slightly paler towards the base: hind wing blackish brown, with the anal third pure white; a very large smooth paler shining patch extending all over the costal margin down to the lower wall of the cell, and reaching to the apex, and bearing on it at the base of the subcostal nervule a small steely-grey patch of roughened scales; a rather small black spot in the lobe and two larger marginal black spots, one in the submedian interspace, the other in the lower median interspace; an anteciliary black line to the white area, thickening into spots at the termination of the two median nervules; anal margin greyish. Underside: fore wing yellowish buff, darker towards the outer margin; inner margin broadly shining greyish, with a darker central spot covered by the tuft of buff-coloured hairs: hind wing paler buff; anal area whitish, and, as on the upperside, with the addition of an inner band composed of four black disconnected irregular markings divided by the nervules; the black spot on the lobe being larger than on the upperside and crowned with a few blue scales. Thorax and abdomen above brown, beneath buff-coloured; legs buff; antennæ black above, white-spotted below, and with pale brown tips.

♀. Differs only from the male in the upperside being a paler shade of brown and in the absence of the shining patch on the hind wing, and in the pale inner margin of the fore wing below being without the gloss. (The inner margin of the fore wing, as is usual in all this group, is nearly straight.)

Expanse, ♂ $1\frac{7}{10}$, ♀ $1\frac{3}{5}$ inch.

Kina Balu (*Waterstr.* and *Everett*). Types Mus. Staud.

This interesting species is remarkable for the close similarity of

the sexes. Dr. Staudinger writes me that he has received a pair only, and we possess a female specimen obtained by Mr. Everett, which I think is referable to this species, although the three black anal spots are larger, and on the underside are all dusted with bluish scales.

M. licinius may perhaps turn out to be the same as Mr. de Nicéville's *Neocheritra nisibis*[1] from the Malay Peninsula and Sumatra, which is described from females only, but I do not think it is likely. However, I am of opinion that it is a mistake to describe insects of such groups as these from females only.

Thrix, Doherty.

This genus is very nearly allied to *Virgarina*, mihi, and is distinguished from it by the possession of an additional (fourth) subcostal nervule in the fore wing, and by the glandular patch being placed somewhat nearer to the inner margin; and it is with much pleasure that I am able to record a species belonging to it from Borneo.

Thrix gama, Distant. (Plate XXXI. fig. 13, ♂.)

Neocheritra gama, Dist. Rhop. Malay. p. 462, fig. 128 (1886).

Labuan (*Waterstr.*).

Dr. Staudinger's collection contains a single male, which I refer to this species, and which I have figured.

It differs somewhat from Mr. Doherty's description in having the basal area of the fore wing slightly dusted with blue. The tuft of orange hairs also cannot be said to be placed in the middle of the fore wing, but is much nearer to the inner margin.

Mr. Doherty states that it apparently mimics *Eoöxylides tharis*, Hübn., but the specimen before me is much more like *Virgarina scopula*, Druce, but is, of course, at once distinguished from that insect by the additional subcostal nervule.

It may be that this Bornean insect represents another species of *Thrix*, but, unfortunately, I do not possess a specimen of *T. gama* with which to compare it.

Neocheritra, Distant.

Neocheritra amrita, var. theodora, H. H. Druce.

I have received a specimen of the green form from Labuan, obtained by Waterstradt.

Jacoona, Distant.

Mr. Distant, in describing this genus in 'Rhopalocera Malayana,' p. 241 (1884), states that it has four subcostal nervules, the first being anastomosed with the costal nervure, which is stated to be short and terminating on the costa before the end of the cell. Now these statements are all incorrect. I have before me typical specimens of *J. anasuja*, Feld., ♂, and, on examination, I find that the costal nervure is long and reaches the margin considerably

[1] *N. nisibis*, de Nicév. J. B. N. H. S. vol. ix. p. 316, pl. P. fig. 45 (1895).

beyond the end of the cell, and that supposing, as I do, that the subcostal nervure reaches the margin, there are only two subcostal nervules—the first being emitted rather beyond the middle of the cell and entirely free for its whole length; the second being emitted rather more than halfway between the end of the cell and the apex.

This description of Mr. Distant's led me to state in P. Z. S. 1895 that the females of this genus possess the same number of subcostal nervules as the males, which now turns out to be incorrect. They have the same number as the females of *Neocheritra* (viz. three), but the first appears to be more bent towards the costal nervure than in that genus.

On examining the neuration of the two species which I have described from Borneo, I find that it is as noted above.

JACOONA METASUJA, H. H. Druce.

The figure given in P. Z. S. 1895, pl. xxxiv. fig. 4, is not a very good one, as it does not show the beautiful opalescent green which is such a distinctive character of this species.

BIDUANDA, Distant.

BIDUANDA HEWITSONII, H. H. Druce. (Plate XXXI. fig. 9, ♂.)

Biduanda hewitsoni, Druce, P. Z. S. 1895, p. 615.

♂. Upperside dark violaceous blue. Fore wing with costa and base narrowly, apex and outer margin broadly black. Hind wing with the shining patch large and conspicuous and extending over half the cell, centred by a large patch of differently-placed cream-coloured scales; apex and anal angle black; a quadrate white spot between the lower median and submedian nervure, placed above the black; a small white patch outwardly bordered by a black line between the two lower tails; lobe dusted with pale blue scales. Cilia of fore wing black, of hind wing white, excepting towards the apex, which is black. The underside differs from that of the female, being of a dull pearl-grey, darker and browner towards the apical and costal margins; otherwise as in that sex.

Expanse, ♂ $1\frac{2}{3}$–$1\frac{3}{0}$ inch, ♀ $1\frac{1}{2}$–$1\frac{1}{10}$ inch.

Sandakan. Type Mus. Druce.

We have received several specimens from Sandakan, and Mr. D. Cator has also captured it at that place in March and May.

From the description this species appears to be very close to *B. cineas*, Grose Smith, which I have not seen; but on the underside the thin metallic blue line extends over the black on the hind wing from the apex to the abdominal margin, whilst in *B. cineas* it appears to be only at the anal angle. The female, as described, of *B. cineas* is quite different from that of *B. hewitsonii*.

MARMESSUS, Hübn.

MARMESSUS BOISDUVALI, Moore, var. ATRA, nov.

♂. Upperside differs from that sex of typical *M. boisduvali* in

the orange fascia on the fore wing being more extensive and reaching along the outer half of the inner margin. On the underside all the bands on the hind wing are deep black, not partly composed of black lines enclosing white areas as in *M. boisduvali*.

♀. Upperside has the orange fascia somewhat less extensive than in that sex of *M. boisduvali*. Underside as male.

Sandakan (*Widmer*), Mus. Druce; Sapagaya (*Cator*).

Mr. D. Cator took this insect in some plenty in June and in August and September. It is interesting to be able to record the species from Borneo, as it appears to have been overlooked until now. *Biduanda imitata*, mihi (P. Z. S. 1895, p. 617), is much like this form on the upperside, but on the underside agrees with *M. boisduvali*.

Eoöxylides, de Nicév.

Eoöxylides etias, Distant & Pryer. (Plate XXXI. fig. 12, ♂.)

Kina Balu (*Waterstr.*); Tandjong, Sandakan (*Cator*).

Dr. Staudinger has sent me both sexes, which agree well with the description and which are strictly congeneric with *E. tharis*, Hübn. It is quite a distinct species. Mr. Cator captured it in April.

Drina, de Nicév.

Drina ninoda, H. H. Druce. (Plate XXXI. fig. 7, ♀.)

♀. Upperside: fore wing uniform dark brown: hind wing—basal and median areas and apex dark brown, a pale spot on the costal margin beyond the middle, and immediately below it a pure white one; anal area broadly pure white, with an anteciliary brown line, dusted along its centre with a few brown scales, and bearing on it, between the lower median nervule and the submedian nervure, a dark brown spot: cilia of fore wing brown, of hind wing white; tail white. Underside as male, but with the bands slightly more prominent.

Expanse $1\frac{9}{10}$ inch.

Sapagaya. Type Mus. Cator.

At first sight I thought this insect represented a new and distinct species, which opinion was strengthened by the fact that the sexes of *D. donina*, Hew., are stated to be very nearly alike [1], but an examination of the underside convinces me that this is the female of *D. ninoda*. Mr. Cator captured a single specimen only.

Lehera, Moore.

Lehera anna, H. H. Druce. (Plate XXXI. fig. 8, ♀.)

Lehera anna, H. H. Druce, Ent. M. Mag. ser. 2, vol. vii. p. 78 (1894).

Kina Balu (*Waterstr.*).

L. anna, with the exception of *Liphyra brassolis*, Westw., is the largest species in the family. I have figured the type.

[1] *Vide* de Nicéville, Butt. Ind. etc. p. 443 (1890).

Deudorix, Hew.

Deudorix diara, Swinhoe. (Plate XXXI. fig. 14, ♂.)

Deudorix diara, Swinhoe, Ann. Mag. Nat. Hist. ser. 6, vol. xvii. p. 357 (1896).

♂. Allied to *D. epijarbas*, Moore; upperside does not differ: underside differs from that species by the ground-colour being principally sordid white, and crossed by broad bands of olivaceous brown in place of white lines; the edges of these bands being arranged as are the white lines in *D. epijarbas*, the only lines showing being those on the outer margins and the usual double-angled lines at the anal angle; black spots and metallic scales at angle as in *D. epijarbas*; head, thorax, and abdomen above and below as in *D. epijarbas*.

Expanse $1\frac{1}{8}$ inch.

Kina Balu (*Waterstr.*).

Waterstradt has sent two specimens of this very distinct looking insect, and Col. Swinhoe has it from the Jaintia Hills.

Since the above given description was written I find that Colonel Swinhoe has already named the insect.

Deudorix strephanus, sp. n. (Plate XXXI. fig. 15, ♂.)

♂. Upperside rich dark shining purple, with the costal apex and outer margins of both wings narrowly dark brown; disc of fore wing below the median nervure and median interspaces of hind wing dusted with rich dark reddish-orange scales (in one specimen almost absent in the hind wing); lobe very small, with a black spot crowned with a few pale blue scales; a few pale blue scales dusted at the base of the tail, which is black with a white tip; anal fold pale brown; cilia of fore wing brown; of hind wing brown, excepting at anal angle and along anal margin, where it is pure white. Underside almost exactly as in *Rapala hypargyria*, Elwes[1], but there appear to be four black spots in the upper series. Head and thorax black above; frons, palpi (with black tips), and thorax white below; abdomen black above, white below; antennæ black above, white-spotted beneath.

Expanse $1\frac{1}{2}$–$1\frac{7}{10}$ inch.

Kina Balu (*Waterstr.*). Type Mus. Staud.

D. strephanus is a true *Deudorix*, being without the shining patch and tuft of hairs as in *D. epijarbas*, Moore, and is remarkable for its close similarity to *Rapala hypargyria* on the underside.

Rapala, Moore.

Rapala barthema, Distant.

Waterstradt has sent a considerable number more males of this species, some of which have a very faint indication of a cupreous disc to the fore wing above, but none have any trace of the purple suffusion of *R. suffusa*, Moore.

[1] *R. hypargyria*, Elwes, P. Z. S. 1892, p. 643, pl. xliii. fig. 7, ♂.

RAPALA SUFFUSA, Moore.

Deudorix suffusa, Moore, P. Z. S. 1878, p. 834, pl. lii. fig. 8.

Kina Balu (*Waterstr.*).

Differs from the male of *R. barthema*, Distant, as I understand that species, in the distinct cupreous disc of the fore wing, and in the beautiful purple gloss, which is quite absent in *R. barthema*.

RAPALA ABNORMIS, Elwes.

Rapala abnormis, Elwes, P. Z. S. 1892, p. 642, pl. xliv. fig. 2, ♂.

Kina Balu (*Waterstr.*).

Dr. Staudinger has received a single male specimen which agrees well with Mr. Elwes's figure. It is a very interesting species, and bears an almost exact resemblance to *Thecla duma*, Hew.[1], described from Bogota, but has a black lobe and one tail only. I have never seen a specimen of *T. duma*, and know it only from the description and figure. Is it possible that there has been some error here?

VIRACHOLA, Moore.

VIRACHOLA SMILIS, Hew.

Deudorix smilis, Hew. Ill. Diurn. Lep., *Lyc.* p. 18, pl. viii. figs. 22, 23, ♀ (1863).

Virachola smilis, de Nicév. Butt. Ind. etc., p. 482, pl. frontispiece, fig. 127, ♀.

Kina Balu (*Waterstr.*).

Dr. Staudinger has also received both sexes from Palawan. The male on the upperside is much like that sex of *V. perse*, Hew., but the blue areas are somewhat more restricted and of a more purple shade; on the underside it is exactly like the female. None of the males I have examined have the yellow spot on the disc of the fore wing, as is sometimes found in *V. perse*. Mr. de Nicéville's figure shows the basal spots filled up more than is seen in Hewitson's, and in this respect agrees with the specimens before me. The female from Palawan has a slight indication of a whitish patch at the end of the cell in the fore wing above.

EXPLANATION OF THE PLATES.

PLATE XXIX.

Fig. 1. *Gerydus improbus*, sp. n., ♂, p. 651.
2. —— ——, ♀.
3. *Cyaniriodes libna*, Hew., ♂, p. 653.
4. *Cyaniris sonchus*, sp. n., ♂, p. 655.
5. *Lampides daones*, sp. n., ♂, p. 656.
6. *Arhopala elopura*, H. H. Druce, ♂, p. 670.
7. —— *tameanga*, sp. n., ♂, p. 658.
8. —— ——, ♀.
9. —— *semperi*, sp. n., ♂, p. 659.
10. —— ——, ♀.
11. —— *dajagaka*, sp. n., ♂, p. 660.
12. —— ——, ♀.

[1] *Thecla duma*, Hew. Ill. Exot. Butt., *Lyc.* p. 211, pl. lxxxiv. fig. 713 (1878).

PLATE XXX.

Fig. 1. *Arhopala drucei*, sp. n., ♂, p. 661.
2. —— ——, ♀.
3. —— *kounga*, sp. n., ♂, p. 662.
4. —— ——, ♀.
5. —— *borneensis*, sp. n., ♂, p. 666.
6. —— *bella*, sp. n., ♂, p. 664.
7. —— ——, ♀.
8. —— *havilandi*, sp. n., ♂, p. 665.
9. —— ——, ♀, p. 665.
10. —— *waterstradti*, sp. n., ♂, p. 668.
11. —— ——, ♀.
12. —— *labuana*, sp. n., ♂, p. 667.
13. —— ——, ♀.

PLATE XXXI.

Fig. 1. *Arhopala moorei*, sp. n., ♂, p. 669.
2. —— *sandakani*, sp. n., ♂, p. 670.
3. —— *deva*, sp. n., ♂, p. 669.
4. *Tajuria dacia*, sp. n., ♂, p. 674.
5. —— ——, ♀.
6. —— *berenis*, sp. n., ♂, p. 674.
7. *Drina ninoda*, H. H. Druce, ♀, p. 680.
8. *Lehera anna*, H. H. Druce, ♀, p. 680.
9. *Biduanda hewitsonii*, H. H. Druce, ♂, p. 679.
10. *Mantoides licinius*, sp. n., ♂, p. 677.
11. —— ——, ♀.
12. *Eoöxylides etias*, Dist. & Pryer, ♂, p. 680.
13. *Thrix gama*, Distant, ♂, p. 678.
14. *Deudorix diara*, Swinhoe, ♂, p. 681.
15. —— *strephanus*, sp. n., ♂, p. 681.

5. On the Anatomy of *Petrogale xanthopus*, compared with that of other Kangaroos. By F. G. PARSONS, F.R.C.S., F.Z.S., F.L.S., Lecturer on Comparative Anatomy at St. Thomas's Hospital.

[Received June 5, 1896.]

The specimen from which the following notes were made was kindly placed at my disposal by Mr. F. E. Beddard, the Society's Prosector. I have been struck by the fact that of late years the Macropodidæ have not received nearly so much attention as the other members of the Marsupial order, and for this reason I have thought it worth while making a fairly exhaustive dissection of *Petrogale*, laying special stress on the vascular, nervous, muscular, and ligamentous systems, and comparing them with the accounts of other writers to which I have had access. The other systems, which are already well known, I have passed over more rapidly, though I am fully alive to the importance of basing our knowledge of the anatomy of any animal on several dissections by different observers.

The Osseous System.

Owen, in his 'Comparative Anatomy of Vertebrates,' has given an excellent account of the Kangaroo's bones, and I only intend to draw attention to certain points which seem to me of special interest. In the first place, the chief characteristics in which the skull of *Petrogale* differs from that of *Macropus* are :—

(1) In *Macropus* the nasal bones have an equal breadth in their anterior two-thirds, the posterior third being only slightly broader. In *Petrogale* the nasals are much more slender in comparison and their posterior half is considerably broader than the anterior.

(2) In *Macropus* the fronto-nasal suture comes farther back than the most posterior point of the fronto-maxillary in most cases. In *Petrogale* the condition is reversed.

(3) In *Macropus* the zygomatic process of the maxilla projects downwards below the cutting-edge of the penultimate molar. In *Petrogale* it is seldom much lower than the alveolar margin of the maxilla. I am not inclined to lay much stress on this distinction, since it seems that the processes of the Kangaroo's skull increase with age.

(4) In my specimen of *Petrogale* the infra-orbital canal was double on both sides, a condition I have found in two out of five skulls. In *Macropus* the canal is occasionally double on one side, but I have not found it so on both sides once in the thirteen skulls I have had the opportunity of examining.

(5) In my specimen of *Petrogale* a Wormian bone (*os antiepilepticum*) was present at the junction of the coronal and sagittal sutures (see fig. 1, p. 685). This bone has been described by Gruber and Howes, and I am inclined to regard it as of some little classificatory value[1]. It occurred twice in the five skulls examined, and I have never seen it in any other Kangaroo.

(6) In *Petrogale* the palatine process of the palate-bone is only represented by a narrow bridge marking the posterior boundary of the hard palate. In *Macropus* the palatine process is complete and the back of the hard palate has no perforation of any size.

(7) The premaxilla of *Petrogale* is a larger bone in comparison with that of *Macropus*, and has not the sharp angle running back between the maxilla and nasal found in the latter.

(8) The inter-parietal bone of *Petrogale* has a very different appearance to that of *Macropus*; in the latter it is a more or less crescentic bone having a much greater breadth from side to side than from before backward, while in the former its antero-posterior measurement equals its greatest transverse, so that the bone forms either an isosceles triangle or a rough pentagon.

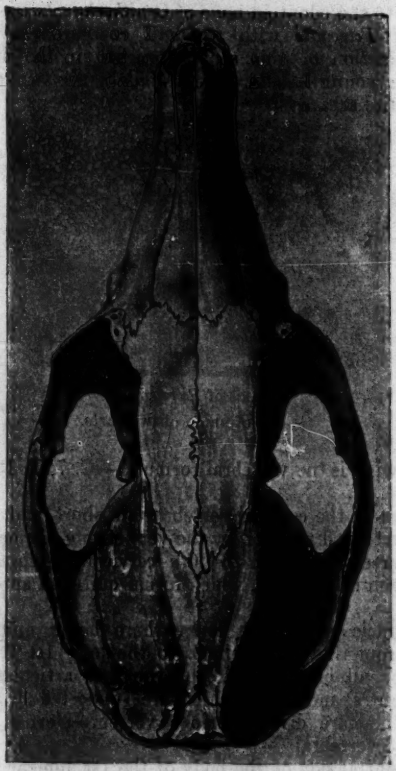
(9) The paroccipital processes are better developed in *Macropus* than in *Petrogale*.

As special stress is laid on the condition of the centres of ossification of the various bones, it will assist in determining the animal's age if the state of the teeth is noticed here. The anterior

[1] See the author's paper on *Atherura africana*, P. Z. S. 1894, p. 677.

molar is calcified and can be seen by cutting away the maxilla; it has not yet replaced the two premolars. The last (4th) molar is being cut.

Fig. 1.



Skull of *Petrogale*, showing os antiepilepticum.

The *Atlas* agrees with that of most Kangaroos in wanting the foramen in the transverse process and in the incomplete ventral arch, which is ligamentous for about one-sixth of an inch.

In an older specimen of the same animal I found this space reduced to a mere suture. The only Kangaroos in which I have found anything like a complete foramen in the transverse process are *Hypsiprymnus* and *Bettongia*.

In the *Axis* the vertebrarterial foramen is incomplete, and I found a similar condition in an older animal. On looking at the

dorsal surface of the body of the axis, a line of cartilage was seen running transversely across just behind the level of the anterior articular facets; this evidently corresponded to an inter-vertebral disc, and it is interesting to notice that, if the two parts of the bone had been separated here, the anterior would have corresponded very closely to the odontoid bone of *Ornithorhynchus*. In the older specimen of *Petrogale* with which I compared my own there was no indication of this separation, but in the disarticulated skeleton of a young Labillardiere's Wallaby the two parts of the axis were quite separate.

Fig. 2.

Axis of *Petrogale*.
A, line of union of two parts.

The following is the vertebral formula:—C. 7, T. 13, L. 6, S. 2, C. 24.

The spines of the cervical vertebræ are short, and the neck is kept in an extended position by the very strong ligamenta subflava. The transverse process of the 6th cervical vertebra has a very prominent ventral tubercle, which forms quite an antero-posterior ridge.

The thoracic spines are long, there being quite a sudden transition from the short 7th C. to the long 1st T. There are thirteen ribs, all of which except the first articulate with two vertebral centra, and all of which are supported by a transverse process. They are divided into 7 vertebro-sternal, 3 vertebro-costal, and 3 vertebral.

On the ventral side of the body of the 1st lumbar vertebra and just to the right of the mid-ventral line there is a single triangular bone fastened by its base to the centrum, while its apex projects ventrally; it seems to be developed in the anterior common ligament, and is more closely attached to the posterior than to the anterior part of the vertebra. From its unilateral position I regard it as one of a pair of hypapophyses or intercentra which has worked forwards from the ventral side of the disc and which may possibly be homologous with the projection from the ventral side of the centrum of the 1st lumbar in the Hare, although that process is median and has no separate centre of ossification.

The lumbar transverse or costal processes have a sharp curve

towards the head at their ends; they are small on the 1st and 2nd vertebræ, but rapidly increase afterwards.

The anapophyses begin on the last three thoracic vertebræ and disappear on the last two lumbar.

Fig. 3.

1st lumbar vertebra of *Petrogale*, with hypapophysis (H).

The *Clavicle* has the usual single forward curve. The *Scapula* resembles that of *Macropus* in the absence of any sign of a metacromial process; a small metacromion is, however, found in *Hypsiprymnus*.

The *Humerus* is chiefly remarkable in that it shows all or almost all the centres of ossification; they consist of the following:—1, head; 2, greater tuberosity; 3, lesser tuberosity (quite distinct); 4, shaft; 5, internal condyle; 6, trochlea and capitellum; 7, external condyle. The centre for the internal condyle takes no part in the bridge of bone enclosing the supra-condylar foramen.

The *Radius* and *Ulna* show all the epiphyses, but that for the upper end of the radius is nearly united to the shaft. The upper epiphysis of the ulna merely forms a cap to the olecranon.

The *Carpal bones* correspond to Owen's description.

In the *Pelvis* the three parts of the os innominatum are completely fused, but there is an epiphysis on the crest of the ilium and on the tuberosity of the ischium, the latter stretching along as far as the subpubic bone, with which in more adult animals it coalesces; there is also a slight ossific deposit in the centre of the pubic symphysis. No special centre is seen for the origin of the rectus femoris.

The *Femur* shows the following epiphyses:—1, head; 2, great trochanter; 3, upper part of lesser trochanter; 4, shaft; 5, lower extremity. The epiphyses for the head and great trochanter meet on the upper surface of the neck. The outer side of the posterior part of the external condyle is lipped and forms a groove for the reception of the elevation on the posterior part of the head of the fibula during extreme flexion of the knee-joint. The *Patella* is almost entirely cartilaginous, but a small bony deposit is seen in the centre. The *Tibia* shows the following centres:—1, head; 2, upper part of cnemial crest where the ligamentum patellæ is attached; 3, shaft; 4, lower extremity. In studying the ossifi-

cation of older bones, I find that the centre for the attachment of the ligamentum patellæ first unites with that for the head, and then with the shaft before the latter is united with the head. The *Fibula* has an upper and lower epiphysis. In the foot the bones are the same as in *Macropus giganteus*. On the plantar surface of the base of the fourth metatarsal there is a facet articulating with a triangular bone, which probably is the rudiment of the first metatarsal; this bone is in close contact with the internal cuneiform, though it does not articulate with it.

The Articular System.

Clavicular Articulations.—The outer end of the clavicle is attached to the tip of the acromion by a ligamentous band about ¼ inch long, so that there is no synovial cavity between these bones. In addition to this there is a coraco-clavicular ligament about ⅓ inch long, which connects the outer end of the posterior border of the clavicle to the small coracoid process; this ligament passes above the origin of the biceps, with which some of its deeper fibres are continuous.

The *Shoulder-joint* has no openings at all in the capsule, the biceps tendon passing entirely superficial to it. It is not specially thickened at any point. When the posterior part of it is cut and the bones separated, a gleno-humeral ligament is seen running obliquely downwards and outwards from the base of the coracoid process towards the lower part of the lesser tuberosity. This so-called ligament is in reality only a fold of the synovial membrane, the free border of which is crenated and projects into the joint cavity; it is best marked near the scapula.

The *Elbow-joint* is remarkable for allowing a good deal of lateral movement when it is flexed. The anterior ligament has two strengthening bands, the external of which is oblique and runs from the external condyle downward and inward to the radius just above the tubercle; it helps to limit pronation when the elbow is extended. The other band is vertical and runs down from in front of the internal condyle to just below the coronoid process of the ulna. The internal lateral ligament consists of two thickened bands arranged in the form of an inverted V, the anterior runs from the internal condyle to the coronoid, the posterior from the internal condyle to the olecranon process; the interval between these is filled in by a thin membrane. The external lateral ligament is a single strong band, which passes from the external condyle to the orbicular ligament and neck of the radius; it is inseparable from the supinator brevis tendon, and from its joint surface there is a pyramidal synovial and fatty projection which occupies the triangular non-articular gap in the outer side of the great sigmoid notch where the olecranon joins the coronoid process. The posterior ligament is thin and lax.

The *Superior radio-ulnar joint* has an orbicular ligament: it

allows pronation and supination to the extent of rather less than a quarter of a circle.

The *Interosseous membrane* is present between the lower two-thirds of the bones; it is strong and has the normal direction.

The *Inferior radio-ulnar joint* has no synovial cavity, and there is no triangular fibro-cartilage.

The *Wrist-joint* consists of two separate synovial cavities; the first between the radius and scapho-lunar is normal, in the second the peg-shaped lower end of the ulna fits into a deep concavity in the cuneiform.

The *Sacro-iliac joint* consists of a crescentic articular surface on the sacrum and ilium, with the concavity forward, *i. e.* towards the head. In front of this articular surface the bones are very rough for a considerable area and are bound together by very powerful sacro-iliac ligaments. There is a distinct synovial cavity between the cartilage-covered surfaces, so that the joint cannot be described as a synchondrosis. Considerable gliding movement is allowed by which the crescentic surface of the ilium describes a small segment of a circle over the similar surface of the sacrum, the centre of the circle being about the middle of the sacro-iliac ligament, the fibres of which are lax enough to allow a certain amount of play. The mobility of this joint is no doubt connected with the great size of the psoas parvus ventrally and the erector spinæ dorsally, and is an adaptation to the Kangaroo's mode of progression. Before taking its leap the animal probably flexes the pelvis on the sacrum by means of the psoas parvus, after which it suddenly straightens its back and extends the pelvis by means of the powerful erector spinæ, in this way assisting the leg-muscles in taking the spring. It is worth mentioning that the left sacro-iliac joint of the animal I dissected was affected with extensive tubercular disease; Mr. Bland Sutton tells me that he has met with this condition on more than one occasion, and considers that it is connected with the mobility of the joint.

The *Pubic symphysis* is formed by a strong cartilage which connects the pubic bones of opposite sides and has no synovial cavity. At the posterior part of the joint the cartilage divides like an inverted Y to include the triangular subpubic bone.

In the *Hip-joint* the capsule is attached above to the margin of the great trochanter, the whole upper margin of the neck of the femur being covered by articular cartilage. Below it is attached to the margin of the head and neck. Anteriorly much more of the neck is included in the capsule than posteriorly. The ilio-femoral band is present, but the thickest part of the capsule is the upper and back, which is doubtless an adaptation to the usual position of the joint in the Kangaroo, a position of extreme flexion and external rotation. The cotyloid ligament is much thicker posteriorly than elsewhere; it is continued into a triangular transverse ligament across the very deep cotyloid notch. The liga-

mentum teres is a very strong fibrous band, which, in the usual position of the joint, passes upward and outward to the head of the femur and takes the greater part of the strain of the joint; above it is a synovial fold containing fat.

The *Knee-joint*, like the hip, is never fully extended, the capsule is strengthened by strong lateral ligaments; the external lateral runs downward and backward from the external condyle to the front of the head of the fibula; its anterior fibres are continuous with the origin of the extensor longus digitorum. The popliteus also performs the function of an external lateral ligament, since it is attached above to the femur and fabella, and below to the external semilunar cartilage and the head of the fibula. During extreme flexion, which is the usual position of the joint, the

Fig. 4.

Knee-joint of *Petrogale* laid open.

Pat.	Patella.	P.C.	Posterior crucial ligament.
F.	Head of fibula.	P.	Popliteus tendon.
Q.E.	Quadriceps.	E.S.	External semilunar cartilage.
S.M.	Synovial membrane.	I.S.	Internal do.
L.M.	Ligamentum mucosum.	E.L.	External lateral ligament.
A.C.	Anterior crucial ligament.	I.L.	Internal do.

fabella articulates with the head of the fibula. The internal lateral ligament extends down the inner side of the head of the tibia for about an inch below the level of the joint; its anterior fibres are attached highest and its posterior lowest. The two crucial ligaments are strong and have the usual attachments. The external semilunar cartilage is attached anteriorly to the tibia just behind the anterior crucial; posteriorly it turns up to be attached to the posterior part of the external surface of the internal condyle some way behind the attachment of the posterior crucial ligament. Externally the popliteus tendon is connected to the convex margin of the cartilage. Besides the above-named posterior attachment of the external semilunar cartilage there is a narrow band which binds it feebly to the posterior margin of the head of the tibia. The synovial membrane of the joint is continued upward under the quadriceps tendon for about half an inch above the top of the articular cartilage of the trochlea. The ligamentum mucosum is well marked and contains a pad of fat in its lower part; above it is continued up as a narrow tube of synovial membrane to the posterior margin of the trochlea. The internal semilunar cartilage is attached anteriorly nearly opposite the external, posteriorly it is fixed to the tibia in front of the posterior crucial ligament.

Fig. 5.

Lower end of femur of *Petrogale*, with ligaments attached.

(Same lettering as fig. 4.)

The *Tibio-fibular Articulations*.—The lower half of the fibula has a concave surface where it is in contact with the tibia and is bound to that bone by fairly strong interosseous ligaments. The upper half of the fibula allows the head to glide backward and forward on the external tuberosity of the tibia for about ¼ inch. During internal rotation of the leg on the thigh the head of the fibula is pressed back by the external condyle of the femur and forms a spring-like buffer to check that movement. The superior tibio-

fibular joint has anterior and posterior ligaments; its synovial cavity is in direct communication with the knee-joint.

The *Ankle-joint* has feeble anterior and posterior as well as strong lateral ligaments. The internal lateral consists of a superficial and a deep portion; the former is a narrow flat band which passes from the back of the internal malleolus downward and forward to the navicular; the deep is much broader and stronger and runs downward and backward from the anterior part of the side of the malleolus to the sustentaculum tali, forming an X with the superficial part. The external lateral ligament consists of three bundles—superficial, middle, and deep; the superficial passes from the back of the external malleolus to the outer side of the calcaneum just behind the articulation with the cuboid; the middle is thicker and stronger, and runs downward and backward from the anterior part of the malleolus to the prominent tuberosity on the outer side of the calcaneum, crossing the superficial bundle to form an X; the deep band runs almost directly backward from the posterior part of the malleolus to the outer side of the astragalus.

Fig. 6.

Ankle-joint of *Petrogale*, from the inner side.

In the *Foot* there are two calcaneo-cuboid ligaments, the outer of which is very strong and runs from the under surface of the calcaneum to the cuboid and on to the bases of the fourth and fifth metatarsals. The inner is much smaller and passes from the sustentaculum tali to the bases of the second and third metatarsals and slightly to the cuboid. As the inner longitudinal arch of the Kangaroo's foot is not developed, the calcaneo-navicular ligament is not very strong. The mechanism of the Kangaroo's foot is interesting, and I hope to deal with it more fully in a subsequent paper.

The Muscular System.

Muscles of the Head and Neck.

The *Temporal* has the usual attachments; it rises as far back as the occipital curved line and as far forwards as the level of the postorbital process of the zygoma; the two muscles of opposite sides do not meet in the middle line of the head.

The *Masseter* is divisible into anterior and posterior portions; the former, which corresponds to the anterior superficial part of Rodents, rises by tendon from the projecting zygomatic process of the maxilla and is chiefly inserted into the inflected angle of the mandible; it is not very satisfactorily separated from the posterior part, which shows signs of being divided into a postero-superficial and a postero-deep portion by a layer of tendon.

The *Internal Pterygoid* is very large while the external is quite small.

The *Sterno-mastoid* runs from the front of the presternum to the paramastoid process.

The *Cleido-mastoid* rises from the middle of the clavicle and is inserted just behind the last, with which it is unconnected; it is pierced by the spinal accessory nerve.

The *Sterno-hyoid* and *Thyroid* are normal; the latter has a tendinous intersection about its middle.

The *Omo-hyoid* is a flat ribbon-like muscle which has the usual attachments to the scapular and hyoid bone; it, as well as the last two muscles, are supplied by branches from the 1st and 2nd cervical nerves direct, instead of through the medium of the hypoglossal. There is no central tendon.

The *Digastric* rises from the tip of the paroccipital process and is inserted into the mandible midway between the angle and the symphysis. There is no distinct tendon, but a small fibrous patch exists above and below, about the middle. It has the usual double nerve-supply.

The *Stylo-glossus* is the only styloid muscle which is well marked; it rises from a tubercle on the anterior border of the paroccipital process.

The *Mylo-hyoid* extends almost as far forward as the symphysis. There is no *Transverse mandibular* muscle.

The *Hyo-glossus* rises from the hyoid bone and from the raphe in front of it; it lies deep to the *genio-hyoid*, but superficial to the *genio-hyo-glossus*.

The *Acromio-trachelian* rises from the 1st, 2nd, 3rd, and 4th cervical transverse processes, and is inserted into the acromion and outer third of the spine of the scapula; it is entirely covered by the trapezius, into which some of its superficial fibres are inserted. Macalister[1] says that it rises from the first three cervical vertebræ in Bennett's Wallaby, and from the first two in the Great Kangaroo.

[1] Ann. & Mag. Nat. Hist. ser. 4, v. p. 154 (1870).

There is no *Scalenus anticus* ventral to the subclavian artery and brachial plexus.

The *Scalenus brevis* rises from the posterior two or three cervical transverse processes and is inserted into the first rib behind the vessels.

The *Scalenus longus* rises with the last and is inserted into the outer surfaces of the 2nd, 3rd, and 4th ribs.

The *Rectus capitis anticus major* rises from the 3rd to the 7th cervical transverse processes as well as, by an internal origin, from the bodies of the anterior four thoracic vertebræ. Its insertion is normal. On the outer side of the last muscle, separated by it from the longus colli, is a muscle which rises from the ventral part of the posterior four cervical transverse processes to be inserted into the body of the axis and the ventral arch of the atlas.

The *Longus colli* is normal, and extends as far back as the 4th thoracic vertebra.

The *Rectus capitis anticus minor* and *lateralis* are normal; the former comes from the transverse process of the atlas, lying external to the major, and ventral to the rectus lateralis.

The *Splenius capitis* is normal and entirely covers the complexus.

The *Splenius colli* is continuous with the last, and is inserted into the transverse processes of the anterior three cervical vertebræ.

The *Trachelo-mastoid* is very well developed; it is inserted into the outer part of the curved line of the occipital bone, into the paramastoid process, and into the transverse processes of the anterior cervical vertebræ. Its insertion is tendinous, and there are two other tendinous intersections further back.

The *Transversalis colli* is large and is inserted into the posterior five cervical transverse processes.

The *Cervicalis ascendens* is inserted into the last three cervical transverse processes.

The *Rectus capitis posticus major* is distinctly bilaminar, a condition I have also found in the Guinea-pig [1].

Muscles of the Anterior Extremity.

The *Trapezius* rises, as in the Great Kangaroo and Bennett's Wallaby, from the ligamentum nuchæ and anterior six thoracic spines; it has a continuous fleshy origin except opposite the first thoracic spine, where it is aponeurotic. It is inserted into the clavicle as far as the origin of the cleido-mastoid, into the acromion, the spine of the scapula, and the fascia over the infraspinatus.

The *Latissimus dorsi* rises from the 5th, 6th, 7th, and 8th

[1] Proceedings of the Anatomical Society, February 1892, p. x.

thoracic spines, and from the 9th, 10th, and 11th ribs. The most anterior fibres are connected with those of the trapezius over the infraspinatus, becoming gradually lost in the aponeurosis; the more posterior fibres wrap round the teres major, as in Man, to be inserted into the humerus.

The *Dorso-epitrochlearis* is small, and does not quite reach the olecranon.

The *Rhomboid* muscles are in one continuous layer; they rise from the ligamentum nuchæ close to the skull, as far back as the 3rd thoracic spine. They are inserted as in Man. Macalister[1] describes a rhomboideus capitis in the Great Kangaroo, as well as in Bennett's Wallaby.

The *Levator anguli scapulæ* and *Serratus magnus* are, as usual, in one layer, which rises from all the cervical transverse processes and from the anterior seven ribs. The slip which rises from the transverse process of the atlas is inserted into the inner third of the spine of the scapula; the rest of the muscle goes to the vertebral border of that bone.

The *Pectoral* mass is divided into four distinct parts: (α) the superficial part rises from the whole length of the sternum and from the inner part of the clavicle, it is inserted into the middle of the humerus with the deltoid; (β) rises from the 2nd and 3rd costal cartilages, and is inserted into the upper part of the pectoral ridge; (γ) comes from the first cartilage, and is inserted just above the last, it is supplied entirely by the internal anterior thoracic nerve; (δ) is the pectoralis quartus, and comes from the linea alba to be inserted with the ventral panniculus just below γ.

Possibly β and γ correspond to the human pectoralis minor.

The *Subclavius* is large, has the usual origin, and is inserted into the whole length of the posterior border of the clavicle.

The *Deltoid* has the three constituent parts—clavicular, acromial, and spinous—fused as in Man; the insertion is into the humerus above the middle. The circumflex nerve supplies the whole of the muscle.

The *Supraspinatus* is smaller than the infraspinatus, as in Bennett's Wallaby. In the Great Kangaroo the two muscles are equal, according to Macalister.

The *Teres minor* is easily separable from the infraspinatus, as it is in the Wallaby, but not in the Great Kangaroo.

The *Teres major* is normal; its lower border is wrapped round by the latissimus dorsi tendon.

The *Coraco-brachialis*, as in all the Kangaroos, consists solely of the rotator humeri. Meckel says that the muscle is entirely absent in these animals, but the rotator humeri, if not specially looked for, is very easily missed. According to Macalister the rotator humeri is divided into two slips in *Macropus ruficollis*.

[1] *Op. cit.*

The *Biceps* has one broad head, which rises continuously from the coracoid and the top of the shoulder-joint; it is entirely outside the capsule of the shoulder. The innermost fibres, those coming from the coracoid, are inserted into the tubercle of the radius, the others pass to the ulna. Macalister describes two separate heads, coraco-radial and gleno-ulnar, in the Great Kangaroo and Bennett's Wallaby. Meckel's account of the muscle in the Great Kangaroo seems to correspond with my own.

Fig. 7.

Pectoral muscles of *Petrogale*.

A. Superficial part of pectoral.
B & C. Deeper parts of pectoral.
D. Pectoralis quartus.
E. Subclavius.
F. Deltoid.

The *Brachialis anticus* consists of two parts: the outer comes from behind the surgical neck of the humerus and from the outer part of that bone; the inner, which is small, rises from the lower third of the anterior border. The two heads unite to be inserted into the ulna with the deep part of the biceps.

The *Triceps* is large and has the human attachments.

The *Anconeus* and *Epitrochleo-anconeus* are well marked and normal.

The *Pronator radii teres* has only the condylar head, which is inserted just above the middle of the radius.

The *Flexor carpi radialis* is normal.

The *Palmaris longus* is large and ends in the palmar fascia, from the inner side of which a muscle rises, ending in tendons for the proximal and distal phalanges of the little finger; this I regard as the abductor minimi digiti.

The *Flexor carpi ulnaris* rises from the internal condyle and from the posterior border of the ulna; but there is no distinct head from the olecranon; the absence of this is also noticed by Macalister in the Great Kangaroo and Bennett's Wallaby. The tendon is inserted into the pisiform bone, over which a sesamoid cartilage is situated.

The *Flexor sublimis digitorum* is small, and rises from the surface of the flexor profundus; it quickly divides into three small muscular bellies, the tendons of which pass to the index, medius, and annularis. The descriptions of Meckel and Macalister agree with this, except that they found tendons to all the fingers.

The *Flexor profundus digitorum* rises from the internal condyle, from the flexor surfaces of the radius and ulna in their upper halves, from the inner side of the ulna, and from the olecranon process. The mass divides into five strong tendons for the thumb and fingers.

The *Lumbricales* are arranged as in Man, except that the one between the annularis and minimus tendons is wanting. This description differs from the one given by Young[1]. He describes four lumbricales in *Petrogale*, one of which is furnished to the thumb.

The *Pronator quadratus* is very thick, and occupies the lower two-thirds of the forearm.

The *Supinator longus* is inserted into the dorsum of the scaphoid. Macalister describes it as being inserted into the first metacarpal in the Wallaby, and into the trapezium and first metacarpal in the Great Kangaroo. Meckel also states that it is present in the Kangaroo.

The *Extensores carpi radialis longior et brevior* were present and normal. Macalister says that they form a single muscle, which is inserted into the 2nd and 3rd metacarpals. I have so often seen this description of these muscles by different authors in various animals, and, on trying to verify it, have always found the two muscles separate, though closely adherent, that I cannot help suspecting that they are normally separate in the Kangaroos.

The *Extensor communis digitorum* is normal, and goes to the four outer fingers.

[1] "Intrinsic Muscles of the Mammalian Hand," Journ. Anat. vol. xiv. p. 156.

The *Extensor minimi digiti* goes to the minimus and slightly to the annularis.

The *Extensor carpi ulnaris* has the usual human attachments.

The *Supinator brevis* consists of only one layer, which is superficial to the posterior interosseous nerve; its tendon forms the external lateral ligament of the elbow, and has an orbicular ligament attached to it. It is inserted into the upper quarter of the radius.

The *Extensor ossis metacarpi pollicis* rises from the ulna as high as the lower margin of the lesser sigmoid cavity, also slightly from the radius. It has the usual insertion.

There is no *Extensor primi internodii pollicis*.

The *Extensor secundi internodii* and *Extensor indicis* form one muscle, which sends tendons to the pollex, index, and medius.

The *Palmaris brevis* is large.

The *Abductor* and *Flexor brevis pollicis* are small and united.

There is no *Opponens pollicis*.

The *Abductor minimi digiti* has already been described with the palmaris longus.

The *Flexor brevis* and *Opponens* of the little finger are present, and rise from the pisiform bone and the sesamoid cartilage over it.

The *Intrinsic muscles* of the hand are arranged in three layers, as described by Cunningham and Young. The superficial and deep layers correspond to Young's description of *Petrogale*, but the intermediate layer has more muscles in it.

Muscles of the Trunk.

The *Serratus posticus* is only represented by the anterior portion, corresponding to the serratus posticus superior of human anatomy; it is well developed, and is inserted into the anterior ribs from the third to the ninth.

The *Erector spinæ* is very strongly developed, but presents nothing unusual.

The *External oblique* rises from the third to the thirteenth ribs; the marsupial bones are developed in it, while the external abdominal ring lies on the outer side of the middle of the marsupial bones. There are three tendinous intersections—one between the 11th and 12th ribs, one between the 12th and 13th, and one below the 13th.

The *Internal oblique* is inserted into the last three ribs; dorsal to the lateral line of the body it is fleshy, while ventrally it becomes aponeurotic and blends with the transversalis.

The *Transversalis* rises from the lower six ribs as well as the lumbar fascia and iliac crest. In the anterior two-thirds of the abdomen it passes deep to the rectus; in the posterior third it splits to enclose that muscle.

The *Rectus abdominis* rises from the body, crest, and pectineal line of the pubes behind the marsupial bone. It is inserted into the first rib by a very short flat tendon, as well as by its inner

border into the cartilages of the second, third, and fourth ribs. It has a few indistinct intersections.

The *Pyramidalis* rises from the inner side and tip of the marsupial bone, and from the fascia over the lower part of the rectus. About midway between the pubes and xiphoid it blends with the linea alba.

The *Supracostalis* rises from the sternal ends of the cartilages of the 3rd, 4th, and 5th ribs, and is inserted into the first rib just external to the attachment of the rectus. It is well marked, and continues the plane of the external oblique, lying between the rectus and the pectoral.

The *Quadratus lumborum* is present, but is extremely difficult to separate from the erector spinæ.

The *Psoas parvus* is very large, and rises from the bodies of all the lumbar vertebræ except the last; it is inserted into the prominent ilio-pectineal eminence.

The *Psoas magnus* is smaller than the last, and rises from the transverse process and side of the body of the last lumbar vertebra, as well as from the anterior part of the sacrum; it joins the iliacus to form a very broad ilio-psoas, which is inserted into the flat lesser trochanter.

Muscles of the Tail.

These muscles are by no means easy to distinguish one from the other, but the following seems the most satisfactory division.

The *Extensor caudæ externus* rises from the accessory processes of all the lumbar vertebræ, from the sacrum, and from the caudal vertebræ nearly as far as the middle of the tail. The tendons, which are very long, are inserted into the transverse processes of the caudal vertebræ, those which rise most anteriorly being inserted first. Meckel[1] describes this muscle as being distinctly divided into two in the Kangaroo, but I was unable to make out the division satisfactorily.

The *Extensor caudæ internus* is fleshy, and rises from the spines of the sacral and caudal vertebræ; short tendons pass to the transverse processes of the vertebræ close behind.

The *Abductor caudæ externus* rises from the ischium, and is inserted into the transverse processes of the 5th, 6th, and 7th caudal vertebræ.

The *Abductor caudæ internus* is simply a continuation of the intertransversales muscles.

The *Flexor caudæ externus* comes from the ventral surface of the sacrum and tail, and is inserted into the ventral surface of the transverse processes by long tendons, which are arranged in the same manner that was noticed in *Sphingurus*[2]—that is to say the most superficial tendons are first inserted, and the deeper ones reach the surface round the inner side of these.

[1] 'Anatomie comparée,' vol. vi. p. 177.
[2] "Myology of Rodents," P. Z. S. 1894, p. 279.

The *Flexor caudæ internus* is inserted by long tendons into the ventral surface of the roots of the transverse processes, the most internal tendons being first inserted, while the deeper ones reach the surface round the outer side of them.

The *Flexor caudæ profundus* is fleshy, and runs along the ventral surface of the tail close to the middle line, being concealed by the last muscle and separated by a nerve from the flexor caudæ externus.

Muscles of the Posterior Extremity.

The *Gluteus maximus* or *Ectogluteus* is a small thin sheet of muscle rising from the sacral spines and fusing anteriorly with the sacro-lumbalis. It is inserted just below the great trochanter.

The *Gluteus medius* is much larger than the last, and rises from the greater part of the gluteal surface of the ilium by two perfectly distinct layers, of which the superficial is inserted by flesh and the deep by tendon into the outer side of the great trochanter.

The *Gluteus minimus* is small, and is covered by the medius; it is inserted by tendon into the front of the great trochanter.

The *Gluteus quartus* or *Scansorius* is very distinct and comes from the ventral border of the ilium; it is inserted into the anterior surface of the femur just below the great trochanter.

The *Tensor fasciæ femoris* and *Sartorius* are inseparable, the latter part being feebly marked; they rise from the anterior ventral spine of the ilium and are inserted into the fascia of the thigh nearly as far as the patella. This sheet of muscle is supplied entirely by the anterior crural nerve.

The *Pyriformis* is well marked and normal.

The *Obturator internus* is normal; on its deep surface the tendon is divided into three bands.

The *Gemelli* are represented by one continuous muscle, which rises from the ventral margin of the lesser sciatic notch; it is best seen when the obturator internus is cut and reflected. Meckel[1] states that these muscles are absent in the Kangaroo.

The *Quadratus femoris* is a large triangular muscle, which is inserted by tendon into the second quarter of the femur.

The *Obturator externus* is large and normal.

The *Biceps* consists of two parts, though I am doubtful whether the part described first should not rather be included with the gluteus maximus. The anterior portion rises from the posterior sacral and anterior caudal spines and transverse processes; it is inserted by a narrow tendon into the outer side of the patella. The posterior part is large and rises from the ischial tuberosity as well as by a small origin from the caudal vertebræ; it is inserted into the fascia of the upper half of the leg.

The *Semitendinosus* rises from the tuber ischii with the biceps, and is inserted into the cnemial crest of the tibia.

The *Semimembranosus* is a small muscle; it rises from the tuber

[1] 'Anatomie comparée,' vol. vi. p. 364.

ischii and is inserted into the internal tuberosity of the tibia, deep to the internal lateral ligament of the knee. Meckel says that it is more or less fused with the semitendinosus.

The *Rectus femoris* rises from the ventral border of the ilium and from the posterior ventral spine by two distinct heads; there is no origin from the usual place in front of the acetabulum.

Macalister found only one head in the Great Kangaroo and Bennett's Wallaby.

The *Vastus externus* is a large muscle and rises from the great trochanter by two heads, which embrace the insertion of the gluteus quartus.

The *Vastus internus* and *Crureus* are small and normal.

The *Gracilis* comes from the whole length of the symphysis and from the subpubic arch, nearly as far as the tuberosity; it is inserted into the cnemial crest above the semitendinosus.

Macalister found it rising from the marsupial bone, a condition which he regards as normal in all Marsupials.

The *Pectineus* is normal.

The *Adductor longus* is represented by a small muscle, which rises from the outer part of the base of the marsupial bone; it is inserted into the second quarter of the femur and is separated from the rest of the adductor mass by a branch of the obturator nerve.

The *Adductores magnus et brevis* form one large mass which cannot be satisfactorily separated. The femoral artery pierces it, but the part of the muscle which lies superficial to the artery, and which corresponds to the supracondylar slip of many mammals, cannot be separated from the rest. According to Macalister the adductor magnus can easily be separated from the brevis in the Great Kangaroo and Bennett's Wallaby.

The *Ischio-femoral* muscle lies behind the adductors and is quite distinct from them; it rises from the whole length of the tuberosity and ramus of the ischium, and is inserted by a triangular tendon into the middle of the back of the femur. It is supplied by the nerve to the hamstrings.

The *Tibialis anticus* comes from the upper quarter of the external surface of the tibia and is inserted into the entocuneiform by a single tendon. In the Great Kangaroo, Macalister found it inserted into the two inner metatarsal bones.

The *Extensor proprius hallucis* rises from the outer tuberosity of the tibia by a small fusiform belly ending in a long tendon, which runs to the inner two of the four toes. This is another instance of the much greater persistence of the extensor tendon of the hallux than of the hallux itself; it is curious, however, that it should have transferred its attachments to the next two toes, and reminds one somewhat of the arrangement of the extensor indicis in the anterior extremity. It should, moreover, be borne in mind that the latter muscle is often one with the extensor secundi internodii pollicis.

The *Extensor longus digitorum* comes from the front of the head and upper third of the fibula, a strong tendon continues this origin

up to the external condyle of the femur; but, as the muscle has contracted attachments similar to those found in Man to the fibula, the upper tendinous part of its origin takes on the function of a ligament. The muscle is inserted in the usual manner into the two outer toes.

The *Peroneus longus* rises from the head and upper quarter of the fibula, as well as from the ligament already mentioned, belonging to the extensor longus digitorum. It is inserted into the entocuneiform.

The *Peroneus brevis* is absent. Macalister, however, found it in the Great Kangaroo and Bennett's Wallaby.

The *Peroneus quarti digiti* is very small and runs from the second quarter of the fibula to the great fourth toe.

The *Peroneus quinti digiti* equals the peroneus longus in size; it rises from the upper third of the fibula and runs to the outermost toe. All three peroneals pass through the same synovial sheath and groove on the back of the external malleolus.

The *Gastrocnemius* has the usual two heads, the outer of which has three origins: (1) a small head from the outer side of the patella; (2) larger, from the same place, and separated from the last by the external popliteal nerve; (3) from the large fabella over the external condyle and from the external semilunar cartilage. The inner head is normal in origin and has no fabella developed in it.

The *Soleus* is absent, unless the origin of the gastrocnemius from the semilunar cartilage represents it. Meckel also describes it as wanting.

Macalister found the fibular head in the Great Kangaroo and Bennett's Wallaby.

The *Plantaris* comes from the external fabella and the back of the external condyle; it soon forms a tendon which passes round the tuberosity of the calcaneum, after which it divides into a large internal and a small external portion. The small slip runs to the outer toe, is pierced by the flexor longus digitorum tendon, and is inserted into the outer side of the second phalanx. The large inner portion gives off a tendon from its outer side which is attached to both sides of the proximal phalanx of the outer toe, being perforated in its course by the last-named slip as well as by the tendon of the flexor longus digitorum to that toe. The main part of the inner portion goes to the proximal and distal phalanges of the great fourth toe.

The *Flexor longus digitorum* (*Flexor tibialis*).—There is only one deep flexor at the back of the leg, which comes from about a third of the tibia and fibula below the popliteus. In the sole it divides into three tendons, of which the innermost again subdivides for the two small inner toes. There are only two *Lumbricales*.

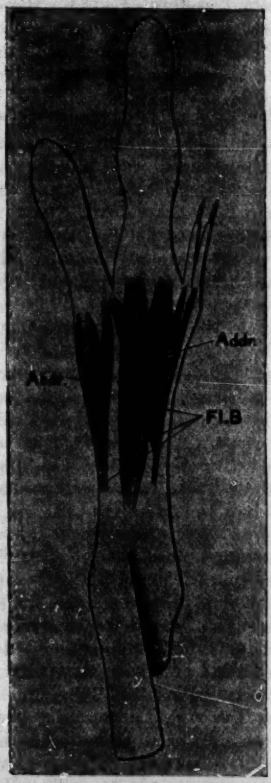
The *Popliteus* rises from the external condyle, partly from in front of the groove and partly from the groove itself, which is deep and narrow, and not adapted for the tendon to lie in. The muscle also has an origin from the external semilunar cartilage and from

the head of the fibula. There is the usual insertion into the upper part of the inner border of the tibia.

The *Rotator fibulæ* lies deep to the last, with which it is partially blended; it rises from the posterior surface of the tibia in its upper part, and is inserted into rather less of the back of the fibula. Its fibres run obliquely upwards and outwards.

Muscles of the Sole.—There is no muscular *flexor brevis digitorum* or *accessorius*. The intrinsic muscles form three layers, the first of

Fig. 8.



Muscles of the Sole of *Petrogale*.

Abdr. Abductor minimi digiti. | Fl.B. Flexores breves.
Addr. Adductor do.

which consists of one adductor, which rises from the third metatarsal bone and runs to the proximal phalanx of the fifth toe. The

middle layer consists of three double-headed flexores breves, the innermost serving for the two small inner toes. The deep layer contains two abductor muscles, one to the fourth, the other to the fifth toe.

The Vascular System.

The *Heart* in *Petrogale* agrees in most respects with Owen's description of the organ in the Great Kangaroo[1]; I propose, however, to describe it a little more in detail. On opening the right ventricle the ventral wall is seen to be covered by columnæ carneæ of the second and third kinds; these are so broad and numerous that the wall presents quite a smooth appearance, the intervals between the columnæ appearing as small rounded pits. There are no musculi papillares or chordæ tendineæ attached to this wall, nor is there any moderator band. The right auriculo-ventricular valve has four cusps, one of which is much larger than the rest and lies against the septal wall, to which its free edge is connected by a large number of short chordæ tendineæ without any musculi papillares. There are only two (Owen says three) musculi papillares in the right ventricle; they are attached to the septal wall, the larger about halfway down, the smaller dorsally and above. Each of these sends chordæ tendineæ to two cusps, and in this way the three anterior segments of the right auriculo-ventricular valve are stayed.

In the left ventricle the auriculo-ventricular or mitral valve has only two cusps, one of which is close to the aortic opening, the other away from it. There are numerous chordæ tendineæ which spring from several large musculi papillares arranged in two groups. The aortic and pulmonary valves have the normal human arrangement, the corpora Arantii being well marked. The right auricle is elongated transversely, at its right extremity is the opening of the posterior vena cava; in the dorsal wall close to this and a little to the left is the opening of the left anterior vena cava. The right anterior vena cava opens on the upper part of the dorsal wall about the junction of the left third with the right two-thirds. At the left extremity of the auricle are the openings of two appendages, one of which projects ventral to the aorta, the other dorsal. Owen describes the right auricular appendage as being notched, but in *Petrogale* the notching is so deep that there are two distinct appendages. There are many and well-marked musculi pectinati in the right auricle, which are best developed on the ventral wall. The right auricle, as Owen points out, is remarkable for the absence of all traces of fœtal structures; there are no signs of the Eustachian or Thebesian valves, nor is there any indication of the fossa or annulus ovalis. The left auricle has musculi pectinati only in the appendage, which is large and forms a great part of the cavity. Owen describes it as being notched, but this I failed to make out. The two pulmonary veins open close together into the dorsal wall.

[1] 'Anatomy of Vertebrates,' vol. iii. p. 517.

The *Thyroid body* consists of two separate oval lobes about ¾ inch long, lying one on each side of the trachea without any isthmus connecting them.

The *Arch of the Aorta* has only two branches, the innominate and the left subclavian; the former gives off the right subclavian, soon after which it divides into right and left carotids.

The *Subclavian arteries* pursue a normal course and give off vertebral, internal mammary, and transverse cervical branches, but no inferior thyroid or superior intercostal were seen. The *common Carotid* gives off the superior thyroid and, at the anterior margin of the larynx, divides into external and internal carotids, the former giving off lingual, facial, and occipital branches, and ending almost entirely in the internal maxillary, the temporal being very small. The superior laryngeal branch comes off from the lingual.

The *Axillary artery* gives off well-marked thoracic, subscapular, and circumflex branches. The *Brachial* gives off a small superior profunda which accompanies the musculo-spiral nerve, as well as a large nutrient branch to the humerus. About the middle of the arm, at the place where the median nerve is finally formed, a superficial branch comes off, which possibly represents the inferior profunda though it does not accompany the ulnar nerve. The brachial artery then passes through the supra-condylar foramen, after which it gives off some muscular branches and soon divides into posterior interosseous and median.

The *posterior Interosseous* passes to the back of the forearm between the two bones, giving off a large posterior interosseous recurrent branch; while the *median* accompanies its nerve into the palm of the hand, where it divides into four digital branches for the clefts between the digits. There is no radial or ulnar artery and no deep palmar arch. Owen[1] describes the artery which I have called median as the ulnar, and says that there is also a radial artery.

The *Thoracic aorta* shows nothing worthy of special notice.

The *Abdominal aorta* gives off the cœliac, mesenteric, and two renal arteries close together, just behind the opening in the diaphragm. Of the two renals the right is a little in front of the left. There is no posterior mesenteric artery, a condition which Owen has noticed in all Marsupials. The aorta trifurcates opposite the disc between the fifth and sixth lumbar vertebræ into the caudal and two external iliacs. The internal iliacs are given off from the caudal opposite the posterior part of the sixth lumbar vertebra, as has been pointed out by Owen.

The *External Iliac* gives off a large ilio-lumbar branch, and, just before reaching the brim of the pelvis, a common trunk, which divides into obturator and deep epigastric.

The *Common Femoral* soon after its commencement gives off an external circumflex branch, which runs outward between the super-

[1] 'Anatomy of Vertebrates,' vol. iii. p. 541.

ficial and deep divisions of the anterior crural nerve. A little lower down an internal circumflex comes off, which divides into a large transverse and a small ascending branch. The femoral artery then continues down Hunter's canal, but no profunda femoris is given off. At the lower part of the canal it divides into two large branches, of which the anterior accompanies the internal saphenous nerve to the inner side of the leg. A little above the internal malleolus it divides into anterior and posterior, the former passing in front of the malleolus and deep to the tendon of the tibialis anticus, to supply the inner side of the dorsum of the foot, the latter supplying the sole of the foot, though no distinct external and internal plantar arteries are present. The posterior of the two branches of the femoral in Hunter's canal is the popliteal, this passes between the semimembranosus and the femur, and divides into superficial and deep. The superficial is a muscular branch to the calf-muscles and runs down between the gastrocnemius and plantaris. The deep passes deeply to the plantaris, pierces the interosseous membrane to become the anterior tibial, and runs down along the outer side of the tendon of the extensor longus digitorum to the dorsum of the foot, the outer side of which it supplies. As soon as it reaches the commencement of the dorsum it gives off a communicating branch which passes superficial to the extensor longus digitorum to join the anterior branch of the internal saphenous artery already mentioned.

The *Internal Iliac* artery divides into gluteal, pudic, and sciatic, of which the last is the largest.

The *Veins* correspond fairly accurately with the arteries, the chief points worthy of notice being the large size of the external jugular, the presence of two anterior and a single undivided posterior venæ cavæ, also of a single azygos vein, which lies on the right side and receives the intercostal veins from both sides of the thorax.

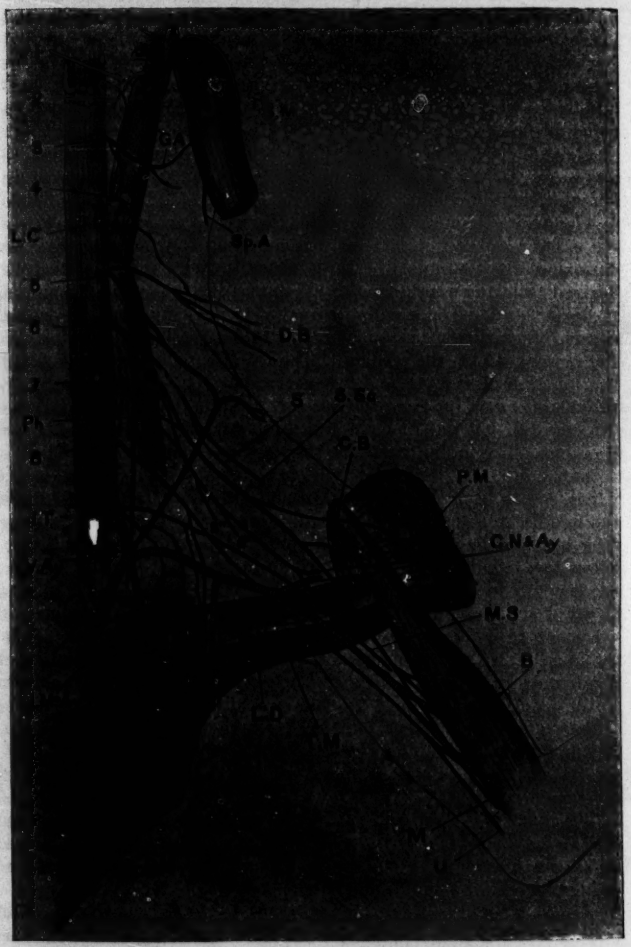
The Nervous System.

As the animal was not received in a perfectly fresh condition, I made no attempt to examine the brain and spinal cord.

The *Cranial Nerves* differ but slightly from those of Man: the chief points of divergence noticed are:—(1) That the seventh nerve only divides into three chief branches on the face; (2) that the depressor nerve is separate from the vagus and comes off from the superior laryngeal as in the Rabbit; (3) that the eleventh nerve pierces the cleido-mastoid after supplying the sterno-mastoid and then passes on to the trapezius; (4) that there is no descending branch from the hypoglossal corresponding to the descendens cervicis of human anatomy, but the omo-hyoid, sterno-hyoid, and sterno-thyroid are supplied by a well-marked nerve which comes off from the 1st and 2nd cervical and corresponds to the communicans cervicis.

The *Cervical Plexus* is formed by the first four cervical nerves; there is the usual loop on the ventral side of the transverse process

Fig. 9.



Cervical and Brachial plexuses of *Petrogale*.

S.M. Sterno-mastoid.
P.M. Pectoral muscle.
T.M. Teres major.
C.B. Coraco-brachialis.
L.C. Longus colli.
L.D. Latissimus dorsi.
B. Biceps.
G.A. Great auricular nerve.
Sp.A. Spinal accessory nerve.
D.B. Descending branches.
Ph. Phrenic.
S.Sc. Suprascapular nerve.
M. Median nerve.
S, S', S''. Subscapular nerves.
C.N & Ay. Circumflex nerve and artery.
M.S. Musculo-spiral nerve.
I.M.Ay. Internal mammary artery.
U. Ulnar nerve.
V.Ay. Vertebral artery.
I.T. 1st thoracic nerve.

of the atlas from which communicating branches are given off. From the 3rd cervical a single large nerve passes to the auricle and occiput, which evidently corresponds to the small occipital and great auricular. From the 3rd also come two superficial cervical nerves, which supply the skin over the anterior and posterior triangles of the neck respectively. The 4th cervical nerve communicates with the upper part of the 5th, and from the junction come off descending cutaneous branches to the skin of the arm and shoulder. From the deep part of the plexus branches are given off to the surrounding muscles, a small communicating spinal accessory coming from the 4th.

The arrangement of the *Brachial Plexus* corresponds very closely with that of Man; it is chiefly remarkable for the fact that the subscapularis is supplied by three separate twigs, one of which is derived from the suprascapular nerve and the other two from the posterior cord. There is no distinct musculo-cutaneous nerve, the coraco-brachialis, biceps, and brachialis anticus being supplied by the outer head of the median. The suprascapular comes off after the junction of the 5th and 6th cervicals. The external anterior thoracic is given off from the outer cord after the junction of the 7th cervical, but has no communication with the internal anterior thoracic. The outer head of the median is, as in Man, derived from the 5th, 6th, and 7th; it is not joined by the inner head, which comes from the 8th cervical and 1st dorsal, until it reaches the middle of the arm. The trunk formed by the union of the two heads passes through the supracondylar foramen and just below the elbow divides into two branches, the outer of which corresponds in its distribution to the human radial nerve, that is to say it supplies the three and a half outer fingers on their dorsal surfaces; in its course down the forearm it lies superficial to all the muscles. The inner of the two branches gives off twigs to the flexor muscles of the forearm and accompanies the median artery to the hand, passing deep to the pronator radii teres, palmaris longus, and flexor carpi radialis. In the hand it supplies the thenar muscles as well as the skin of the outer three and a half fingers on their palmar surfaces. There is no distinct anterior interosseous branch.

The ulnar nerve separates from the inner head of the median just above the middle of the arm; it at once gives off two internal cutaneous branches for the inner side of the forearm and then passes deep to the epitrochleo-anconeus, which it supplies. Immediately after this it gives off a branch to the flexor carpi ulnaris, but none to the flexor profundus digitorum, and passes down the forearm under cover of the flexor carpi ulnaris to the radial side of the pisiform bone, giving off, at the junction of the middle and lower thirds of the forearm, a dorsal cutaneous branch, which supplies the back of the inner one and a half fingers. At the pisiform the main stem of the ulnar divides into superficial and deep branches, the former supplying the skin of the ulnar one and a half fingers on their palmar surfaces, the latter passing between

the layers of the adductors and flexores breves to supply these as well as the interosseous muscles.

The internal anterior thoracic nerve is not nearly as large as it is in animals with a better developed panniculus: it rises by two roots from the 8th cervical and 1st thoracic nerves respectively; these roots unite and supply the posterior and deep parts of the pectoral mass as well as the ventro-lateral panniculus.

The musculo-spiral nerve is formed by the union of two branches in front of the teres major muscle; the upper of these comes from the 5th, 6th, and 7th cervical, the lower from the union of the 8th cervical and 1st thoracic nerves. The musculo-spiral winds round the back of the humerus, giving off branches to the triceps and dorso-epitrochlearis as well as a descending branch to the anconeus, but no filament to the brachialis anticus or cutaneous twigs. In front of the external supracondylar ridge a branch to the supinator longus is given off, after which the nerve passes deep to the supinator brevis and supplies all the muscles of the back of the forearm, as well as a cutaneous branch to the skin of that region.

The circumflex nerve is given off from the upper branch of the musculo-spiral and so can only obtain fibres from the 5th, 6th, and 7th cervical nerves; it accompanies the circumflex artery through the quadrilateral space, giving off branches to the teres minor and shoulder-joint; it then gives off a large branch to the skin of the outer side of the arm and finally supplies the three parts of the deltoid.

The phrenic nerve comes from the junction of the 5th and 6th cervicals, and runs back ventral to the plexus and subclavian artery, to pursue its usual course through the thorax to the diaphragm.

The posterior thoracic nerve cannot be seen in the axilla until just before its distribution; it rises from the 4th and 5th cervicals, and runs back in the substance of the scalenus longus to the serratus magnus.

No intercosto-humeral nerve was seen.

In studying the foregoing nerves the arrangement of the radial is worthy of special attention, because it is opposed to the law laid down by Paterson in his most interesting paper on the limb plexuses of Mammals[1]. In that paper the following passage occurs:—"In the case of the fore limb the nerves of distribution are derived from the inferior primary divisions of the hinder cervical and first thoracic nerves. The nerves entering the plexus divide into ventral and dorsal parts, the ventral divisions of the nerves combining to form one set, the dorsal divisions combining to form another set of nerves of distribution. In no case do ventral divisions ever combine with dorsal divisions of adjacent nerves. In no case does a nerve of distribution derived in one animal from ventral divisions, in another spring from dorsal divisions and *vice versa*." The musculo-spiral is rightly described

[1] Journ. Anat. vol. xxi. p. 622.

by Paterson as derived from the dorsal divisions of the plexus, the median as derived from the ventral. In all the animals dissected by Paterson, and in all that I have hitherto dissected, the radial nerve came from the musculo-spiral; in this case, however, the radial rose on both sides from the median, although no connection between that nerve and the dorsal roots was observed in the plexus.

The arrangement of the *Lumbar Plexus* of the Rock-Kangaroo closely resembles that of the *Cuscus* described by Cunningham[1]; it is formed by the 2nd, 3rd, 4th, and a large part of the 5th lumbar nerves, the 1st lumbar being distributed to the abdominal walls.

The genito-crural nerve is very small and rises from the 2nd and 3rd lumbar, whence it runs down to supply the cremaster, no crural branch being seen.

The anterior crural comes from the 3rd, 4th, and 5th lumbars, and emerges from the outer surface of the psoas, soon after which it gives off the external cutaneous to supply the skin of the outer side of the thigh. As soon as the nerve has passed under Poupart's ligament it gives off a cutaneous branch to the skin of the front and inner side of the thigh. Soon after this a branch runs outwards to supply the sartorius, and from this a twig enters the superficial surface of the rectus femoris. The next branch is the long saphenous which comes off from the inner side of the nerve, passes superficial to the external circumflex artery, and supplies the skin on the inner side of the leg below the knee. The rest of the branches of the anterior crural pass deep to the external circumflex artery and supply the quadriceps extensor set of muscles. The obturator nerve comes from the anterior divisions of the 4th and 5th lumbar, passes to the obturator foramen, and divides into a brush of branches which supply the adductor muscles as well as the gracilis. No distinct division into superficial and deep parts was noticed.

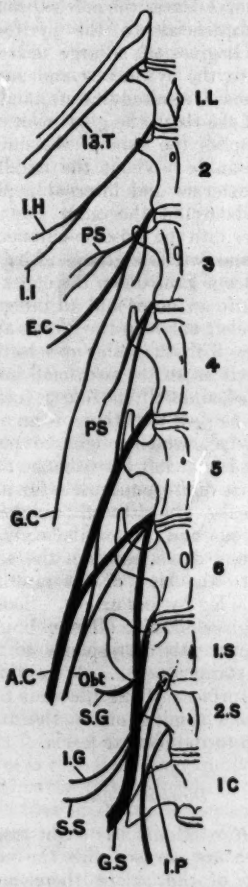
In the plexus, branches to the psoas come from the 2nd and 3rd as well as the junction between the 4th and 5th lumbar nerves.

The *Sacral Plexus* is formed by the 5th and 6th lumbar and the greater part of the first sacral nerves, which all unite to form the main trunk of the great sciatic. From the junction of the 5th and 6th lumbar nerves the superior gluteal is given off, as is the case in the sacral plexus of the *Cuscus*; this nerve supplies the gluteus medius, minimus, and quartus. The inferior gluteal comes off in common with the small sciatic after the union of the 1st sacral with the cord formed by the 5th and 6th lumbar (lumbo-sacral cord); it supplies the gluteus maximus and the anterior part of the biceps. The small sciatic supplies the skin of the back of the thigh as usual.

The pudic nerve is formed by the part of the 1st sacral which

[1] Journ. Anat. vol. xv. p. 265.

Fig. 10.



Lumbo-sacral plexus.

I.H. Ilio-hypogastric.	I.G. Inferior gluteal.
I.I. Ilio-inguinal.	S.S. Small sciatic.
PS. Branches to Psoas.	G.S. Great sciatic.
E.C. External cutaneous.	I P. Internal pudic.
G.C. Genito-crural.	I.L. 1st lumbar vertebra.
A.C. Anterior crural.	I.S. 1st sacral vertebra.
Obt. Obturator.	I.C. 1st caudal vertebra.
S.G. Superior gluteal.	

does not enter the sciatic trunk, joining the 2nd sacral; it supplies the pelvis and perineum.

The great sciatic nerve leaves the pelvis through the great sciatic foramen, passing superficial to the pyriformis; just before reaching that muscle it gives off a large nerve to the hamstrings, which passes deep to the pyriformis and supplies the posterior biceps, semimembranosus, semitendinosus, and the ischio-femoral. In the upper third of the thigh the great sciatic gives off the short saphenous which supplies the skin of the outer side of the leg from the knee to the ankle. About the middle of the thigh the sciatic divides into external and internal popliteal branches, the former of which winds round the outer side of the head of the fibula, where it divides into the musculo-cutaneous and branches to supply the peroneal and extensor groups of leg-muscles.

The musculo-cutaneous runs down the outer side of the leg and divides at the ankle into an outer and an inner branch; the outer of these supplies the cleft between the fourth and fifth toes as well as the outer side of the fifth, the inner goes to the inner side of the large fourth toe as well as to the two small inner toes, that is to say to the second, third, and half the fourth toes, the first toe being absent. It will thus be seen that there is no anterior tibial nerve in the Kangaroo, a fact which might be predicted when one remembers that there is no cleft between the first and second toes nor any extensor brevis digitorum muscle for it to supply.

The internal popliteal nerve gives off branches for the gastrocnemius, plantaris, popliteus, and rotator fibulæ; it passes through the popliteal space and runs down, between the superficial and deep muscles of the calf, to the back of the internal malleolus, being unaccompanied in the leg by any artery. Soon after passing the internal malleolus it gives off a small deep branch to the muscles of the sole, which apparently corresponds to the greater part of the human external plantar nerve. After this the main trunk supplies the plantar surfaces of all the four toes, the branch for the outer one and a half coming off in the anterior part of the sole and passing deep to the plantar fascia.

Digestive System.

The roof of the *Hard Palate* has eight transverse ridges, the anterior two of which are curved, with the convexity forwards. In the anterior half of the palate there are many tubercles between the ridges, a condition which has been described by Flower in the Didelphyidæ [1]. The *Soft Palate* is smooth on both its nasal and buccal surfaces; it ends posteriorly in a deep sharp notch, and there is no sign of a uvula.

The *Tongue* has four transverse ridges rather behind the centre of the dorsum. There are backwardly directed filiform papillæ all over the surface, while the fungiform papillæ are best

[1] Lectures on the Comparative Anatomy of the Organs of Digestion of the Mammalia, College of Surgeons, 1872, Lecture XII.

marked on the posterior part of the dorsum. Foliate papillæ are present in their normal position but are feebly marked. There are three circumvallate papillæ, the central one being well marked, while the lateral ones are indistinct and situated just in front of the papillæ foliatæ. The *Tonsils* answer to Owen's description [1]; each consists of eight or ten nodules of lymphatic tissue about the size of a pin's head lying in a well-marked fossa just beneath the soft palate. The *Parotid Gland*, as is usual in the Macropodidæ, is very large and reaches from the root of the ear along the side of the neck, dorsal to the external jugular vein, almost to the scapula. The *Submaxillary Gland* is small and oval, and is situated on the ventral side of the external jugular vein just clear of the angle of the jaw.

The *Sublingual Gland* is very small.

The *Œsophagus* is long and narrow and has a considerable course in the abdomen.

The *Stomach* of *Petrogale penicillata* has been carefully examined by Beddard and contrasted with that of *Dendrolagus bennettii* [2]. The stomach of *Petrogale xanthopus* agrees with his description and I shall content myself with mentioning that it measured 24 inches along the greater curvature and 13 along the lesser.

The *Spleen* differs from that of *Dendrolagus* and resembles the normal marsupial arrangement in being distinctly Λ-shaped; the stalk and posterior limb of the Λ together measure 5½ inches, the anterior limb 2 inches. The stalk and posterior limb evidently correspond to the spleen of other mammals, because the gastro-splenic omentum is attached along them. Apart from the place where the extra limb comes off there are no notches in the spleen.

The *Liver* of *Petrogale penicillata* has been figured by Beddard: the arrangement of its lobes agrees very accurately with that of *P. xanthopus*; the same notch is present in the Spigelian lobe, though it is less well marked.

The *Pancreas* is about 6 inches long, its head is surrounded by the duodenum, while the long thin tail reaches the spleen.

The *Small Intestine* is 8 ft. 6 in. long, the *Large*, 3 ft. 8 in.; this is about the same proportion that Beddard describes in *Dendrolagus*. Garrod [3] says that in *Darcopsis luctuosa* the large intestine is one-third the length of the small; in *Petrogale*, however, the proportion is greater. The bile-duct opens into the duodenum 3 inches from the pylorus, the pancreatic duct just beyond. In the Great Kangaroo, Owen says that the bile and pancreatic ducts unite and open 5 inches from the pylorus.

The *Cæcum* is 6 inches long, and is not sacculated as Owen describes it in the Great Kangaroo; its calibre is greater than that of the rest of the colon; the ileum joins it at an acute angle, and

[1] 'Anatomy of Vertebrates,' vol. iii. p. 385.
[2] P. Z. S. 1895, p. 131.
[3] P. Z. S. 1875, p. 56.

the two portions of gut are connected by a fold of peritoneum which reaches almost to the extremity of the cæcum.

The Genito-urinary System.

The male genito-urinary organs answered so well to Owen's description that I refrain from making any remarks about them.

The Respiratory System.

The *Larynx* is remarkable for the great size of the arytenoids, which, as Owen points out [1], are situated at the side instead of on the dorsal surface. The part of these cartilages which points towards the head of the animal is a broad convex border instead of forming the apex of a pyramid; from the anterior end of this border the short vocal cords pass to the thyroid. There are no false vocal cords or ventricles. The epiglottis is large, and is deeply notched in the middle of its free edge. The ventral part of the anterior edge of the thyroid cartilage curls over towards the cavity of the larynx and forms a little pouch just behind the stalk of the epiglottis.

The *Trachea* is a little over 4 inches long; the cartilaginous rings form rather more than complete circles, so that one end overlaps the other on the dorsum: this arrangement allows a considerable dilatation of the tube.

The *Thyroid Gland* is described in the account of the vascular system.

The *Lungs* are remarkable, as is usual in Kangaroos, for the small amount of lobulation which they exhibit. The right lung is much larger than the left and has a well-marked azygos lobe; from the ventral border of this lung a long triangular process projects, in front of which are two notches. The left lung has one notch on its ventral border, but, like the right, is undivided by fissures. Owen [2] states that in *Macropus major* the right lung has two notches in its anterior (ventral) border, while the left is undivided; in *M. parryi* both have one or two notches; in another Kangaroo he found the right lung divided into four lobes and the left into two. On neither side is there any eparterial bronchus.

[1] 'Anatomy of Vertebrates,' vol. iii. p. 584.
[2] 'Anatomy of Vertebrates,' vol. iii. p. 577.

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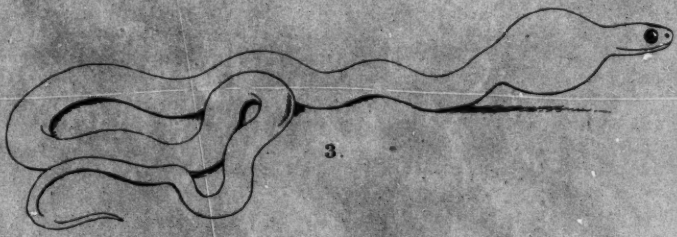

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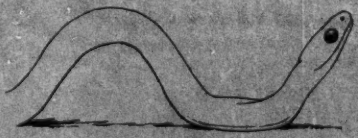

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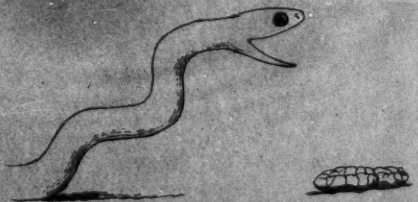

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M.E. Durham. del. P. Smit lith. Mintern Bros. imp.

DASYPELTIS SCABRA.

6. Notes on the Mode of Feeding of the Egg-eating Snake (*Dasypeltis scabra*). By Miss M. Edith Durham[1].

[Received June 8, 1896.]

(Plate XXXII.)

The following observations were made on a specimen of this Snake from South Africa, presented to the Society's Gardens by Mr. J. Matcham, C.M.Z.S., of Port Elizabeth, and measuring 18·8 inches in length.

The snake, on perceiving the egg, glided round it and examined it frequently with its tongue (fig. 1); it then raised its head and made a rather feeble, ineffectual snap at the egg. Finally, however, it opened its mouth very widely, and suddenly seizing the egg by the smaller end, the jaws and the skin under them expanding enormously, swallowed it quickly and with a strong effort (fig. 2).

The egg being now in the œsophagus, the snake remained still with its head raised, its spine strongly arched, and the whole throat greatly distended (fig. 3).

It then, slowly and with evident effort, lowered its head till it rested on the ground (figs. 4 and 5), straightening its spine by degrees and thus driving the spinal "teeth" into the egg and crushing it. The egg gradually flattened, and the snake resumed its natural proportions in about 15 minutes from first seizing the egg. It lay still for a quarter of an hour, exserting its tongue occasionally, the body and tail still maintaining the position shown in fig. 3.

It then suddenly and violently began to press the portion of its throat containing the egg against the ground (fig. 6), at the same time arching its body behind it and raising its head. These efforts appeared violent and convulsive, and were repeated several times in succession, the snake meanwhile crawling about restlessly. Then, pausing, it raised its head, swayed it slightly to and fro, gave a violent lateral wriggle, opened its mouth widely, and with a effort ejected the crushed egg-shell (see fig. 7), 1 hour and ¾ after first seizing the egg.

The process of swallowing and disgorging has been the same every time I have witnessed it, but has sometimes been quicker.

I have never seen the subject of these observations take anything larger than a hedge-sparrow's or a canary's egg, but very large specimens can even swallow hen's eggs—witness the specimen preserved in the British Museum with the uncrushed egg still in the œsophagus. The power of distention of the jaws and throat is very great, the circumference of the egg being nearly three times that of the neck of the snake in its usual condition.

EXPLANATION OF PLATE XXXII.

Figs. 1–5. The various stages of *Dasypeltis scabra* in the act of swallowing an egg, as described above.
Figs. 6 & 7. The rejection of the shell.

[1] Communicated by Dr. John Anderson, F.R.S., Vice-President. On this subject see Mr. Tegetmeier's article in 'Field,' vol. lxxx. p. 204, July 30th, 1892.—P. L. S.

7. On the *Theraphosidæ* of the Lower Amazons: being an Account of the new Genera and Species of this Group of Spiders discovered during the Expedition of the Steamship 'Faraday' up the River Amazons. By Fredk. O. Pickard Cambridge, B.A.[1]

[Received June 16, 1896.]

(Plates XXXIII.–XXXV.)

The Spiders described in the present paper form a first small instalment of the collection made by Mr. Austen and myself during our expedition up the Lower Amazons in the s.s. 'Faraday,' under the charge of Mr. Alexander Siemens. The idea of publishing the zoological results of the expedition in book-form by the Museum of Natural History has, I believe, been definitely abandoned. This being the case, I have availed myself of the generosity of this Society, and shall endeavour to publish my account of the Araneidea in small sections, as opportunity offers.

The identification of members of this order is by no means the easy matter one would suppose; for not only does the material itself offer great difficulties, but almost every point of classification has to be reinvestigated *ab initio*.

Of the total number of species represented in the collection I am, of course, unable to speak with certainty at present, but I should probably be within the mark if I were to estimate it at about 200. How many of these may be new it is impossible to say, though they will scarcely perhaps bear the proportion of eleven new species to fourteen described, as has been the case in the present paper in the family *Theraphosidæ*.

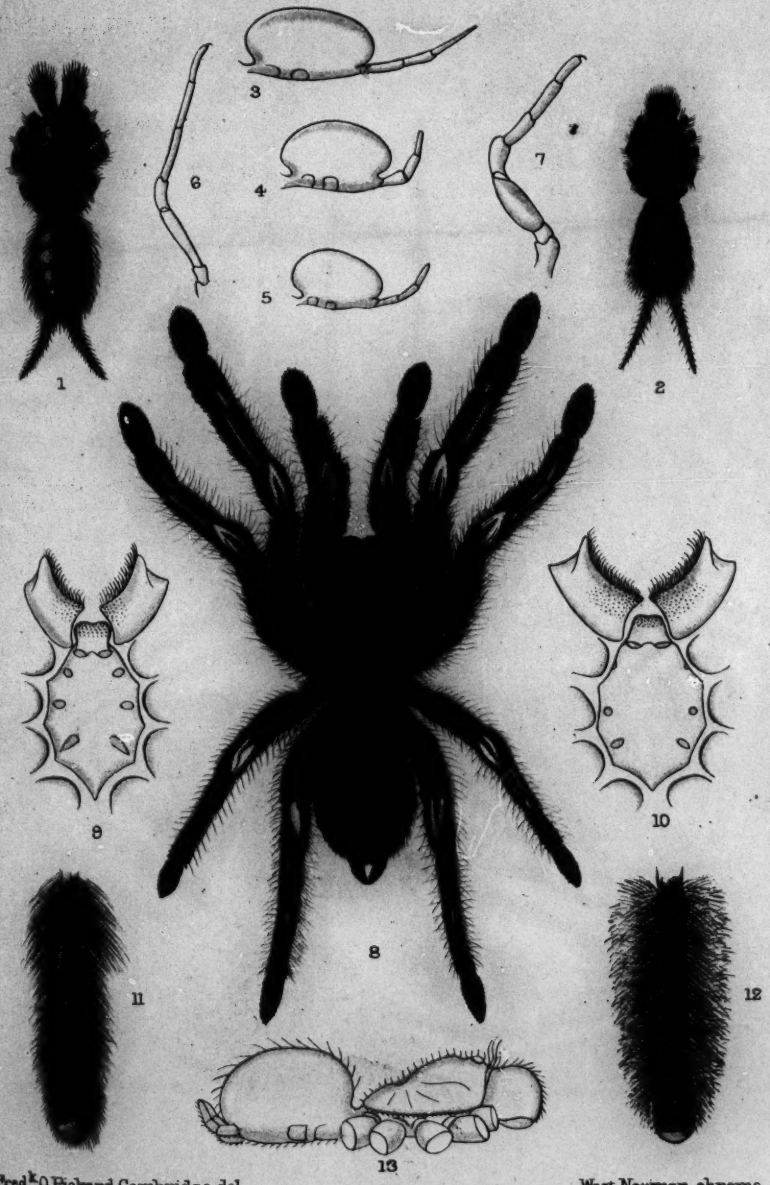
The district of the Amazon Valley may be broadly divided into three fairly well-marked regions. First, the alluvial region of the river itself, including the countless islands and vast tracks of luxuriant river-margin.

Second, the higher and drier Campos districts, sandy regions clothed with grass and spangled with flowers soon after the commencement of the rainy season, about the month of March or April.

Third, that vast region significantly termed by the natives "*Terra Firma*," clothed for hundreds and hundreds of square miles by the impenetrable forest.

And to these three regions I must add what I may term the "*Lago* district,"—the Lake district so-called—where acres of rushes, sedge-grass, and water-weeds furnish a habitat frequented by a fauna evidently peculiar. Here almost every form seems to be adapted for a semi-amphibious existence. Large Spiders

[1] Communicated by the Secretary.



Fred.k O. Pickard Cambridge del. West, Newman chromo.

New Theraphosidæ from the Lower Amazons.

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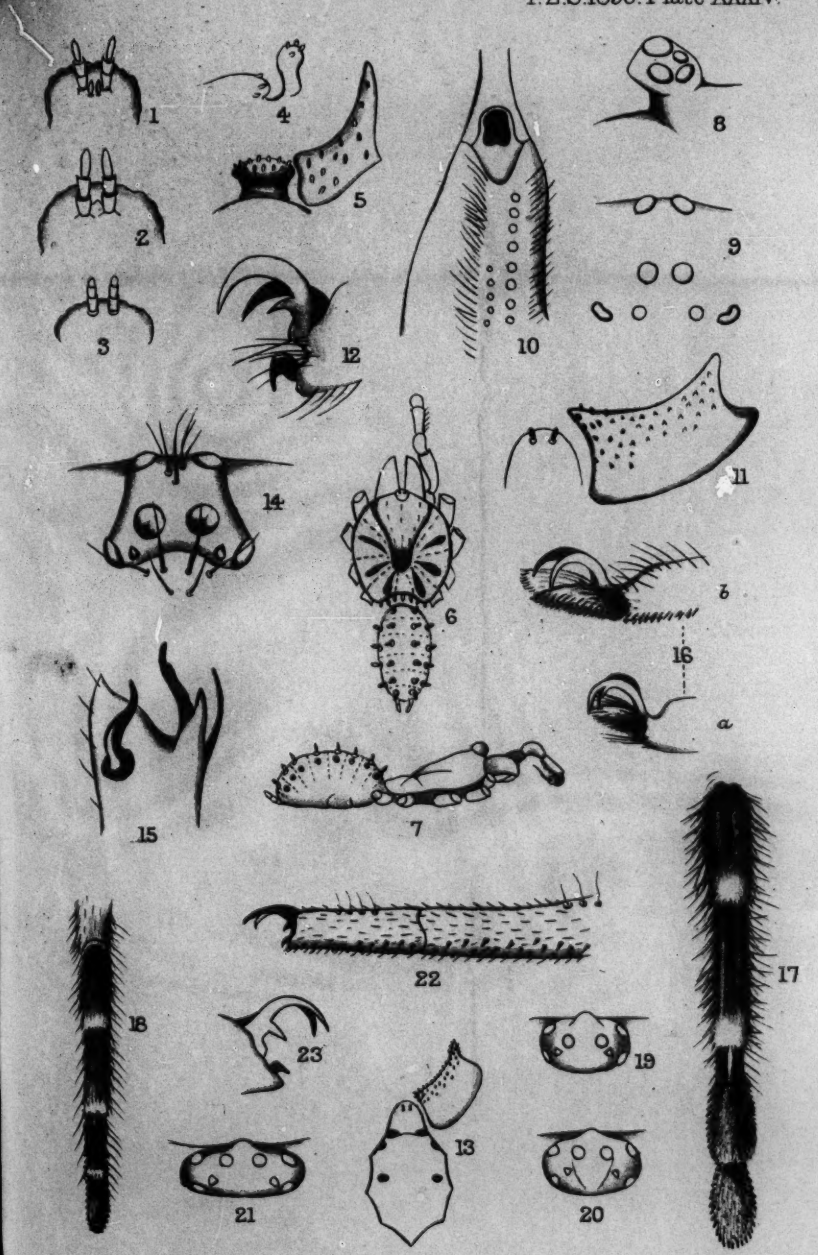
P.Z.S.1896. Plate XXXIV.



Fredk. O. Pickard Cambridge del. et lith.

West, Newman imp.

New Theraphosidæ from the Lower Amazons.

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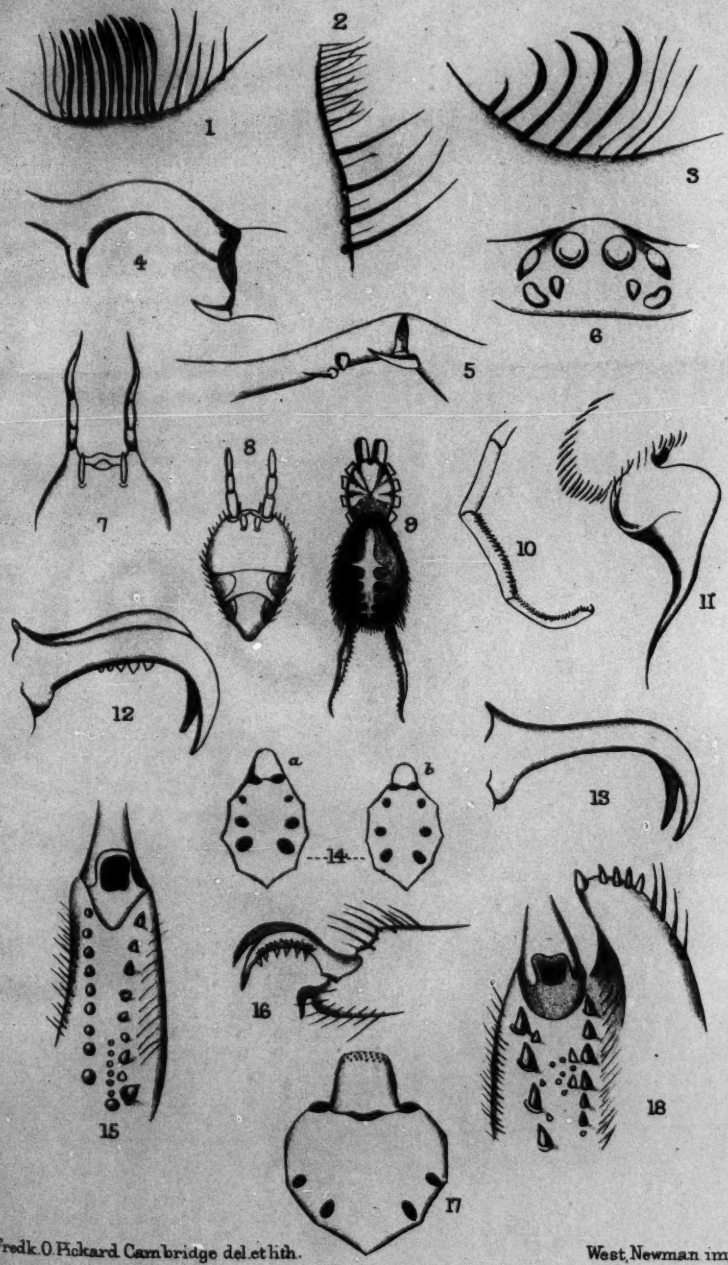

Fredk. O. Pickard Cambridge del. et lith. West, Newman imp.

New Theraphosidæ from the Lower Amazons.

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of the group *Triclariinæ* vie with the essentially semi-aquatic *Dolomedes* in displaying their skill in running upon and diving beneath the surface, out of sight and out of reach of enemies in pursuit.

Throughout the three first-mentioned regions there are, of course, certain Spider forms found sprinkled equally over each—as, for instance, the ubiquitous *Avicularia*, the "*Aranha caranjuejira*," the crab-spider *par excellence* of the native Brazilian. But there are also many special forms, each of them peculiar to their special district.

Here one finds, too, 4000 miles on the other side of the globe, beneath an equatorial sun, forms strangely familiar to the English naturalist in districts of similar physical character at home.

The sandy campos, for instance, furnish us with a *Lycosa*, in colour adapted to its environment, and curiously similar to the *Lycosa picta* of our English sand-dunes.

In the forest, Epeirids, Theridiidæ, and Salticids swarm, of every shape and hue. Thomisids, too, the majority very similar to European species in general character, to which the pure white waxen *Eripus*, lurking in some snow-white blossom, is a notable exception.

One must not, however, have the impression that the Spider-fauna of tropical America is much the same as that of England. We have nothing, for instance, to compare with the curious Gastracanthids, the crimson-spined *Micrathena schreibersi*, or the numerous species of the thorny-backed genus *Gastracantha*. We have nothing to match the huge *Nephila* with her diminutive husband, or the lovely *Argiope argentata* stretched on the white silken cross in the centre of its orbicular snare. Except an *Atypus* or two, we have nothing to take the place of the 250 species and upwards of the *Mygalomorphæ* which are found in Southern and Central America. So that, although many a familiar form will meet the eye of the English arachnologist on the Amazons, yet there are countless forms differing in size, in structure, and in colour from anything that he can find amongst the Spider-fauna of Northern Europe.

One must confess, too, that at the present time arachnologists still know *next to nothing* of the Spiders of Brazil. Nor do I speak only of differences specific, a more extended knowledge of which merely multiplies the known species ten or a hundredfold: nor only of a knowledge which enables us with certainty to pair this female with that male which, according to the laws of Nature, rightfully belongs to her—a matter of no little difficulty even to specialists. I refer rather to our knowledge of almost everything which has to do with their habits and domestic economy. We must confess, for instance, that we do not yet know the staple diet of so common and so well-known a Spider as the huge *Avicularia*. Though I was out night after night, and though I watched, on several occasions the whole night through, the tunnels of twenty and upwards of the sand-burrowing "*Mygale*,"

so common in the neighbourhood of Santarem, yet not *once* could I detect a Spider in the act of seizing her prey or even venturing beyond the entrance of her burrow.

I accentuate these deficiencies in our information, because one so often hears of a traveller neglecting to collect material, or make observations of habits, on the grounds that the "Authorities" at home nowadays know *everything* and that the trouble taken would be but labour lost.

Among the more interesting incidental discoveries made during the work of classification, I might mention that of the stridulating-organs found in three species of the subfamily *Diplurinæ*. These—to which I have given the names *lyra* and *pecten* (the former referring to a row of chitinous keys on the inner side of the coxa of the pedipalp, the latter to a row of spines on the mandible)—are very similar to the musical boxes found in certain Oriental groups of *Mygalomorphæ* by Mr. Pocock. Of what may be their real use, and of what their ultimate significance in systems of classification, it is perhaps a little too soon to speak.

Before concluding these few remarks by way of preface to the more technical and less interesting descriptive matter, I would like to take the opportunity of giving my hearty thanks to the many kind friends from whom I received both encouragement and actual assistance during our expedition up the Amazons.

Had it not been for the courtesy of Mr. and Mrs. Alexander Siemens, I should probably not have visited Brazil at all. Nor must I forget to thank Mr. Brocklehurst, of Pará, through whose kind introduction I fell into the hands of Mr. Wallace, an American gentleman resident in Santarem. For my fortnight's excursion in the forest I am entirely indebted to Mr. Wallace, who courteously placed his country residence at my disposal and gave me every assistance in his power to render my sojourn a complete success.

To the many other friends whom I came across both afloat and ashore, too numerous to mention by name, I must give my thanks *en masse*.

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1893. R. I. Pocock.—Ann. Mag. Nat. Hist. ser. 6, vol. xi.
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Amongst the many useful handbooks on zoology issued from time to time by Dr. E. Goeldi of the "Museu Paraense" at Pará, will be found two on the "Spider-fauna" of Brazil. The first,

published in 'Sonderabdruck aus Mittheilungen aus dem Osterlande,' neue Folge, V. Band, pp. 200–248, while Dr. Goeldi was still in the neighbourhood of Rio Janeiro, deals with the general question of the state of knowledge of the Spider-fauna of Brazil at the time he wrote. This pamphlet, entitled "Zur Orientierung in der Spinnenfauna Brasiliens," falls into four sections, the third of which is divided again into four subdivisions.

I. "Der Stand der Kenntnis der brasilianischen Arachniden vor 1880."
II. "Erweiterungen seit 1880."
III. "Versuch einer Charakteristik der Spinnenfauna der mittleren Küstenprovinzen Brasiliens."
  A. "Die Spinnenfauna der Stadt Rio de Janeiro, beziehungsweise ihrer nächsten Umgebung."
  B. "Die Spinnenfauna des Urwaldgebietes der heissen Niederung."
  C. "Die Spinnenfauna des Urwaldgebietes des Orgelgebirges (Provinz Rio de Janeiro)."
  D. "Spinnen aus dem Sertão der Provinz São Paulo."
IV. "Einige Beobachtungen über das Geschlechtsleben einzelner Epeiriden Brasiliens."

This short though comprehensive treatise forms a valuable introduction to the subject, and is written in the German language.

1894. Goeldi, Dr. E.—"Estudos Arachnologicos relativos ao Brazil," Boletim do Museu Paraense de Historia Natural e Ethnographia, Pará, 1894, pp. 32–39.

This short paper is the first of what Goeldi hopes will be a series of papers dealing with the whole known Spider-fauna of Brazil. It contains Section I. 'Revisão das Territelarias Brazileiras,' divided into seven subdivisions, each of which contains a brief summary of the species of *Theraphosidæ* described by the various authors who have written on them.

A. "Territelarias de viagem Spix e Martius (1817–1820) elaboradas por M. Perty."
  (Six species and two new genera, *Idiops* and *Actinopus*.)
B. "Territelarias na grande obra de Hahn e Koch sobre os Arachnidos (1831–1848)."
  (Twenty-four species, subgenus *Mygale*, and *Actinopus tarsalis*.)
C. "Territelarias de viagem do Conde François de Castelnau elaboradas por Lucas (1843–1847)."
  (Six species, three new, subgenera *Mygale* and *Actinopus*.)
D. "Territelarias brazileiras citadas no trabalho monographico de A. Ausserer, 1871–1875."
  (Thirty species and seven doubtful under sixteen genera.)
E. "Territelarias de viagem do Prof. E. von Beneden, descriptas pelo Dr. Ph. Bertkau (1880)."
  (Eleven species, all new; one new genus, *Thalerothele*.)

F. "Territelarias brazileiras descriptas na grande obra do Conde Eugen von Keyserling sobre as 'Aranhas da America (1892).'"
(Fourteen species, four new ones.)
G. "Territelarias brazileiras segundo a obra do Dr. Eugène Simon, 'Historia natural dos Arachnidos' (1892–1894)."

The total number of species belonging to South America is computed at 248.

These brief extracts from Dr. Goeldi's paper, which is written in Portuguese, will give some idea of its value to students in Brazil desirous of becoming acquainted with work already done amongst the *Theraphosidæ* of South America. I have to thank Dr. Goeldi for the opportunity he has given me of perusing these publications during my brief visit to the Pará Museum in January 1896.

Suborder MYGALOMORPHÆ, Pocock, Oct. 1892.

It is not altogether easy to decide which of the various subordinal names proposed for this group of Spiders is the most suitable and therefore to be retained. We have first of all the ancient division of the order by Walckenaer into two large suborders under the names "*Thérophoses*" and "*Araignées*" (Ins. Apt. tome i. 1837, p. 38). These are of the same value as the "*Mygalées*" and "*Aranées*" of Dugès ("Observation sur les Aranéides," Ann. Sci. Nat. sér. 2, tome vi. 1836, p. 162). Next we have the subordinal division made, under the names of "*Quadripulmonaires*" and "*Bipulmonaires*," by Dufour ("Arach. Quadripulmonaires," Ann. Gén. Sci. Phys. vol. iv. 1820), equivalent to the *Tetrapneumones* and *Dipneumones* of Latreille, these names being of course based upon the possession of one pair or two pairs of lung-books.

Later, in 1870, we find the whole order subdivided into seven suborders—the *Orbitelariæ*, *Retitelariæ*, *Tubitelariæ*, *Territelariæ*, *Citigradæ*, *Laterigradæ*, and *Saltigradæ*—by Dr. Thorell, corresponding, as he himself tells us, with the almost similarly named families of Latreille, of which the suborder *Territelariæ* corresponds to the *Thérophoses*, *Mygalées*, and *Tetrapneumones* of the earlier authors.

In his Hist. Nat. Araign. i., Oct. 1892, p. 61, M. Simon recognizes two suborders under the double names "*Araneæ Theraphosæ*" and "*Araneæ Veræ*"—the former including *Liphistius* and the families *Avicularïidæ* and *Atypidæ*; the latter the *Hypochilidæ* (a tetrapneumonous form) and every other known family.

In October of the same year Mr. R. I. Pocock, in a paper on the Classification of Spiders (Ann. Mag. Nat. Hist. ser. 6, x. p. 306), has divided the order Araneæ into two main divisions—the *Mesothelæ*, including the family *Liphistiidæ*, and the *Opisthothelæ*, including every other known family. These two divisions are based upon the position of the spinning-appendages in the middle of the ventral area or at the distal end of the abdomen.

The division *Opisthothelæ* is subdivided into two suborders similar in their extent to those of M. Simon, for which Mr. Pocock has selected the names *Mygalomorphæ* and *Arachnomorphæ*.

So recently as March 1, 1895, Dr. Thorell ('Descript. Catalogue of the Spiders of Burma') has selected two new names for two similarly constituted suborders—*Parallelodontes* and *Antiodontes*, referring of course to the articulation of the mandibles. These two suborders are apparently equivalent to M. Simon's "*Aranеæ Theraphosæ*" and "*Aranеæ Veræ*," and to Mr. Pocock's "*Mygalomorphæ*" (excluding *Liphistius*) and "*Arachnomorphæ*."

Which of these names are most suitable? One might suppose that those which referred to some important character would be the most convenient; but such is not necessarily the case, since, for instance, the division into *Tetrapneumones* and *Dipneumones* was entirely suitable until the discovery of "*Hypochilus*," with four lung-books, and the fact that "*Nops*" had no lung-books but four tracheal stigmata; so that, although Dr. Thorell's terms "*Parallelodontes*" and "*Antiodontes*" are suitable as referring to an important differential character of the two groups, yet these, too, are liable to be laid aside, when perhaps some form is discovered offering in itself characters proving it to belong to both suborders.

As a matter of fact, the names which have less direct reference to such characters are in reality after all more convenient, and indeed suitable, and certainly a single name is more convenient than a double one—"*Mygalomorphæ*" than "*Aranеæ Theraphosæ*," for instance.

For these reasons I have retained the terms "*Mygalomorphæ*" and "*Arachnomorphæ*" in the present paper; while I can see no reason for substituting the new family name *Aviculariidæ* of M. Simon for the older and quite as suitable name *Theraphosidæ* of Thorell, following Walckenaer.

Family THERAPHOSIDÆ, Thorell.

List of Genera, Species, and Subspecies from the Lower Amazons from January to March, 1896—including twelve genera, fourteen species, and one subspecies: of these, four genera are new, eleven are new species, one a new subspecies, and one the male sex of which is new to science.

Subfam. PARATROPIDINÆ.
Genus *Paratropis*, E. Sim. Species *P. papilligera*, n. sp., ♂ ♀, p. 723.
„ *Anisaspoides*, new. „ *A. gigantea*, n. sp., ♀, p. 726.
„ ACTINOPODINÆ.
Genus *Actinopus*, Perty. Species *A. wallacei*, n. sp., ♀, p. 728.
„ CTENIZINÆ.
Genus *Acanthodon*, Guérin. Species *A. santaremia*, n. sp., ♀, p. 733.
„ BARYCHELINÆ.
Genus *Homœoplacis*, E. Sim. Species *H. austeni*, n. sp., ♂, p. 735.
„ AVICULARIINÆ.
Genus *Acanthoscurria*, Auss. Species *A. geniculata*, C. K., ♀, p. 737.
„ „ „ „ *A. brocklehursti*, n. sp., ♀, [p. 739.

Genus *Avicularia*, Lamarck. Species *A. avicularia*, Linn., ♀, p. 741.
„ „ „ „ *A. a. variegata*, n. subsp., ♀, [p. 743.
„ *Santaremia*, new. „ *S. pococki*, n. sp., ♀, p. 746.
Subfam. Diplurinæ.
Genus *Harmonicon*, new. Species *H. rufescens*, n. sp., ♀, p. 756.
„ *Melodeus*, new. „ *M. sanguineus*, n. sp., ♀, p. 758.
„ „ „ „ *M. niger*, n. sp., ♀, p. 759.
„ *Fufius*, E. Sim. „ *F. auricomis*, E. Sim., ♂ (new), [♀: p. 750.
„ *Ischnothele*, Auss. „ *I. siemensi*, n. sp., ♀, p. 762.

Genus *Neodiplura*[1], n. g. Species *N. jelskii*, n. sp., ♂ ♀, p. 755.
„ *Santaremia*[1], n. g. „ *S. longipes*, n. sp., ♀, p. 749.

Family Theraphosidæ.

Genus Paratropis, E. Simon.

Type. *P. scruposa*[2], E. Sim. (♀), Ann. Soc. Ent. Fr. 1889, pp. 214, 215. *Hab.* Upper Amazons. 14 mm. long.

Paratropis papilligera, n. sp. (Plate XXXIV. figs. 1, 6, 7, 8, & 23, and Plate XXXV. fig. 17.)

♂ ♀. *Hab.* Santarem, Lower Amazons. ♂ 12·75 mm. long; ♀ 12·5 mm. long. Types in coll. Brit. Mus. Nat. Hist. London.

♂.—*Carapace* almost circular, purple-brown, entirely and minutely granulate. Cephalic ridge bearing three longitudinal lines of fine rufous hairs; ocular region more densely clothed with similar hairs; thoracic area clothed with converging lines and margin of carapace fringed with rufous hairs. Cephalic and thoracic impressions distinct. Central fovea deep, procurved. Base of carapace slightly emarginate, fringed with short bacilliform hairs. Cephalic area almost two-thirds the length of carapace.

Abdomen dull brown, bearing four longitudinal dorsal rows of eight to nine small tubercles, each emitting from its summit a rufous, plumose, bacilliform hair. Lateral area finely tuberculate, furnished with scattered rufous hairs. Ventral surface pale rufous, rugulose. *Spinners* four: posterior pair pale, straw-yellow, dusky above, three-jointed, one-third total length of abdomen; basal joints equal, apical joint twice the length of basal: anterior pair equal in length to basal joint of posterior pair, almost contiguous, half a diameter apart.

Ocular tumulus tuberculiform, globular. Anterior row of eyes slightly procurved. Anterior centrals largest, one-third their diameter apart and from anterior laterals. Diameter of latter almost equal to that of former. Posterior centrals smallest, almost

[1] *Neodiplura jelskii* was taken in Peru by Dr. Jelski; while *Santaremia longipes* is a native of Trinidad.

[2] The specific name under which the type is described in *op. cit.* is "*scruposa*," not "*scrupea*" as accidentally quoted in Hist. Nat. Araign. 1892, i. 1, p. 78.

in contact with posterior laterals and anterior centrals. Laterals of both rows almost in contact.

Mandibles purple-brown, clothed along ridge with rufous hairs; sides with single band of short hairs, more numerous below. Fang-groove fringed on outer margin with row of curving rufous hairs, those on inner margin similar but less dense. Floor of groove bearing two rows of conical teeth of irregular size and length. Inner row, commencing at base of fang, composed of 14, outer row, commencing between numbers 4 and 5 of inner row, composed of 10 rather stouter teeth.

Sternum broader than long, smooth, almost circular, pale fulvous, exhibiting before base of labium a low transverse ridge. Sigilla not distinct; 1st, 3rd, and 4th pairs visible. *Labium* quadrate, oblique, not distinctly impressed at base by sigilla; entire anterior margin studded transversely with numerous minute cusps. *Coxa of pedipalp* pale fulvous, its anterior apical angle elongate, pointed; inner margin fringed with rufous hairs, and inner surface studded with numerous minute cusps, clustered towards inner basal angle.

Legs. Coxæ fulvous; i. and ii. brown; iii. and iv., femur, patella, and tibia brown; protarsus and tarsus pale fulvous. Femur of i. and ii. bearing a few minute spines, those of iii. and iv. more numerous. Patella and tibia of 1st pair incrassate, the latter bearing beneath a few setiform hairs; of ii., iii., and iv. slender, bearing numerous setiform hairs beneath. Protarsus and tarsus of all four pairs furnished with numerous setiform hairs, spines on iii. and iv. Tarsus of all four pairs without a true scopula, but bearing beneath numerous, scattered, scopuliform hairs. Tarsi i. and ii. with three claws, superiors with a single tooth below the middle, inferior claw minute; tarsi iii. and iv. with two claws, superiors with a single submedian tooth, inferior claw obliterated.

Pedipalp dull brown. Patella geniculate; tibia broad, fringed on outer side with stiff setiform hairs; tarsus one-third the length of tibia, short, globular; bulb compressed, pyriform; stylum curved downwards and outwards, a little longer than tibia.

Comparative measurements in millimetres.—♂. Carap. 6·75 long., 6·75 lat. Abd. 6 long., 3·5 lat. Ceph. area 4·5 long. Stern. 3·75 long., 4·5 lat. Coxa of pedipalp 2·5 long., 1 lat. Pedes, long. i. 26—ii. 21—iii. 18—iv. 25. Artl. i. long. 3—1—6—2—5·75—5—2·5. Artl. iv. long. 2·5—2—6—2—5—5·5—3. Postr. mam. 2 long; artl. ·5—·5—1. Antr. mam. ·75 long., ·5 separ. Mandib. 2·5 long.

♀.—Carapace, abdomen, and legs almost entirely encrusted with minute grains of grey grit, concealing the purple-brown colour and the granular surface of the carapace, save here and there. The encrustation also obliterates or conceals the rufous hairs, and many of the bacilliform hairs as well. Underside comparatively free from encrustation, fulvous. Abdomen, sternum, eyes, labium, and coxa of pedipalp similar in character to those of the male. Anterior row of eyes, however, slightly *recurved*.

Legs shorter and stouter than in the male; tarsus i. furnished

with a double series of from 6–7 small cusps, on either side, beneath; tarsus ii. *without any spines*, but furnished with numerous spiniform hairs; tarsi iii. and iv. without spines, but armed with spiniform hairs. Protarsus i. furnished with numerous stout cusps beneath; protarsus ii. with a few apical and a few other spines on the underside; protarsi iii. and iv. furnished with numerous spines. Tibiæ i. and ii. armed beneath with numerous bacilliform spines. Tibiæ iii. and iv. armed with numerous spines beneath. Tarsi i. and ii. three-clawed, superiors with single submedian denticle; tarsi iii. and iv. two-clawed, superiors with single submedian denticle, inferior claws obliterated.

Spinners four: posterior pair less than one-third the length of abdomen; basal joints equal; apical joint double the length of basal: anterior pair very short, equal to basal joint, half a diameter apart.

Fang-groove furnished on both sides with a row of stiff rufous hairs, those on the outer margin coarser. Floor of groove studded with a double series of conical teeth, on the inner margin 14, on the outer margin 10, the latter being the longest. Tooth no. 9 on outer margin is inserted opposite tooth no. 14 on the inner margin.

Comparative measurements in millimetres.— ♀. Carap. 5·5 long., 5·5 lat. Abd. 7 long., 5 lat. Ceph. area 4 long. Stern. 2·75 long., 3 lat. Coxa of pedipalp 2·5 long., 1 lat. Pedes, long. i. 18 —ii. 14·5—iii. 14—iv. 20. Artl. i. 2·5—1—4·5—2—3·5—3—2. Artl. iv. 2·25—1—5—2—3·5—4—2. Postr. mam. 2 long.; artl. ·5—·5—1. Antr. mam. ·5 long., ·25 separ. Mandib. 2·5 long.

In both sexes there are present on each of the last three joints of all four pairs of legs, on median line of tarsi, at base of protarsi, and at base of tibiæ on both sides, several small round tubercles, from whose summit there issues a single, long, fine "*sensory hair*."

The male and female described above were taken together beneath a damp decayed log of wood in the low-lying part of the forest south of Santarem, on the Lower Amazons. The female was partially buried in the soil beneath the log, the whole body being apparently bedewed with fine drops of moisture. She remained perfectly motionless, and appeared as though dead and in process of decomposition through what appeared to be a minute fungus. The supposed fungus, however, proved to be only the papilliform hairs, each with several drops of moisture on its surface. There appeared to be no tube or nest of any kind, and one is led to suppose that the hairs are used for perceiving the passage of an insect over the spider as it lies buried in the mud. Whether this is so or not one cannot, of course, pronounce with certainty; but the encrustation of the spider with grains of grit, rendering it almost invisible when half buried in the earth, would seem to point to some such habit. The male, which was lying with its legs gathered together, close to the female, is, however, not so encrusted with grit, though the plumose papilliform hairs are very noticeable.

I am unable to satisfy myself that *P. scruposa*, E. Sim., ♀, *op. cit.*, is identical with the species now before me. The description shows that they are undoubtedly closely allied; but of *P. scruposa* M. Simon says: "*Tarso 2 paris intus, prope apicem, aculeo unico instructis.*" The tarsi of the second pair in *P. papilligera* have not this apical spine. He also says: "*Abdomen—aculeis bacilliformis fulvis elevatis paucis, in series transversas parum regulariter ordinatis, munitum,*" and makes no mention of the regular transverse rows of tubercles, each of which bears a bacilliform hair. I have therefore considered it more prudent, and less liable to cause subsequent confusion, to describe the present species as new. In any case the male is unknown to science, and would, on that account, merit a careful description.

Note.—Since writing the above another female, 13 mm. long, and a smaller one have come to hand from amongst my captures in the forest at Santarem. These specimens entirely bear out the distinctions made between *Paratropis* and *Anisaspis*, while at the same time proving how inconstant are the number and position of spines and cusps, and how unreliable, as a character, is even the dentition of the mandibles. The eyes are closer together; the spinners *four in number*; the legs longer in proportion. The anterior tarsi have only a single row of cusps on either side, but the cusps are more numerous than in the female above described. The fang-groove is furnished with 16 teeth on the inside and 2 supplementary ones towards the apex, and 14 on the outer margin. The number of teeth is thus greater by 2 in each row than in the type female. The female described above must still be held as the type, although the other is a finer specimen, for both male and female were found side by side under the same piece of wood.

One cannot be thoroughly satisfied concerning the differential characters of these Spiders until more material is available for careful comparison.

Anisaspoides, gen. nov.

Generic Characters.

Mamillæ two. Terminal joint nearly double the length of basal. Inferior claw present on tarsi i. *and* ii., *absent on tarsi* iii. *and* iv. *Fang-groove furnished with two rows of* 7–14 *teeth respectively.*

Anisaspoides gigantea, n. sp. (Plate XXXIV. figs. 2 & 22.)

♀. *Hab.* Breves, Lower Amazons. 12·75 mm. long. Type in coll. Brit. Mus. Nat. Hist.

♀.—*Carapace* a little longer than broad, purple-brown, finely granulate, and so closely encrusted with fine grit as to almost entirely obliterate all traces of the fine rufous hairs, of which there are three converging lines on the cephalic ridge, converging lines on the thoracic area, and a marginal line round the carapace. Central fovea deep, transverse, procurved.

Abdomen encrusted with grit; bearing four rows of tubercles,

each emitting from its summit a single, long, fine bacilliform hair. When first captured these were perfect; they have since, however, become effaced, except at the base of the abdomen.

Ocular tumulus tuberculiform, globular. Anterior central eyes slightly smaller than anterior laterals; a little more than the radius apart, nearly one diameter from anterior laterals. Anterior row straight. Posterior centrals very small, one diameter from anterior centrals, almost in contact with posterior laterals; the latter ellipsoidal, one quarter of its axis from anterior laterals, which is greater than the diameter of either of the anterior central or anterior lateral eyes.

Sternum broader than long; sigilla encrusted and scarcely visible. *Labium* quadrate, apex transversely studded with numerous minute cusps. *Coxa of pedipalp* produced at anterior apical angle into a long spur-like prominence; its anterior surface studded with minute cusps, clustered more closely towards basal anterior angle; the joint is stouter, longer, and more thickly fringed with rufous hair than in *Paratropis papilligera*, ♀.

Legs. Tarsi and protarsi i. and ii. furnished beneath with two series of paired teeth, each pair obliquely situated; but their position is not absolutely regular. Tarsi and protarsi iii. and iv. with two series of long stout spines beneath.

Tarsal claws. Three on tarsi i. and ii., superiors with single denticle towards base; inferior claw present. Tarsi iii. and iv. with two superior claws, each with a single denticle towards base, inferior claw obliterated. Glandular tubercles on tibiæ. Protarsi and tarsi similar in position to those of *P. papilligera*, ♀.

Spinners, two only; posterior pair less than one-half the length of abdomen; basal joints equal in length, apical joint one-fourth longer than basal joint. Anterior pair of spinners obsolete.

Mandibles similar to those of *P. papilligera* in character, but the two rows of teeth with which the fang-groove is furnished differ somewhat in number and arrangement. Outer row containing 7 stout teeth; inner row containing 14 teeth of smaller size. Tooth no. 7 in outer row stands opposite tooth no. 14 of the inner row, whereas in *P. papilligera* it stands opposite no. 12 of the inner row.

Comparative measurements in millimetres.—♀. Carap. 6·75 long., 6 lat. Abd. 7·5 long., 5·75 lat. Ceph. area 5·25 long. Stern. 3 long., 3·75 lat. Coxa of pedipalp 3 long., 1·5 lat. Pedes, long. i. 20—ii. 15—iii. 13—iv. 20. Artl. i. long. 3—1—5—2—4—3—1·75; iv. 2·5—1·75—5—2—4—4·5—2. Postr. mam. 3 long.; artl. 1—1—1·25. Antr. mam. absent. Mandib. 3 long.

A single female, agreeing almost entirely in general appearance with the female of *Paratropis papilligera*, was taken under a log in the damp forest at Breves, on the Lower Amazons, near the Island of Marajo.

Genus Anisaspis, E. Simon.

Type. *A. tuberculata*, E. Sim. (♀), Proc. Zool. Soc. 1891, p. 549. *Hab.* St. Vincent, West Indies. 4–6 mm. long.

Types, three females in coll. Brit. Mus. Nat. Hist.[1] (Plate XXXIV. figs. 3, 4, 5.)

Having carefully examined the three specimens referred to above, I find that, doubtless owing to an oversight by the author, they do not entirely agree with the generic diagnosis given in Hist. Nat. Ar. i. 1, 1892, p. 78, in, at any rate, one very important character—"*Cephalothorax humilis et fovea carens.*" This character is certainly not distinctive of the type specimens. Being encrusted with grit, a feature which seems to be common to the females of this subfamily, and the central fovea being filled up, it doubtless escaped observation. From two of the three specimens however, this grit was carefully removed, and a distinct, deep fovea laid bare. The other specimen certainly to all appearance merits the description "*Cephalothorax humilis et fovea carens*"; but it is only in the appearance that it does so.

There are three characters, however, in which these type specimens differ from the female to which I have assigned a new generic position (*Anisaspoides*), as well as from *Paratropis*. Simon says of them:—"*Mamillæ duæ—ultimo medio multo breviore et subrotundato*"; "*parte labiali apice arcuata et remote spinulosa*"; and "*pedum ungue inferiore nullo.*"

Whether the last of these characters is of any real significance for purposes of classification in a group in which there is evidently a tendency towards obliteration of the inferior tarsal claw, I am not in a position to judge; but, for the present, one would scarcely be justified in including in a genus, of which one of the chief characters lies in the total absence of the inferior tarsal claw, a spider which possesses a distinct inferior claw on the tarsi of the first two pairs of legs.

A. Mamillæ four ..... *Paratropis*, Sim.
B. Mamillæ two .....
1. Claws on anterior tarsi—i. and ii.—three..... *Anisaspoides*, n. g.
2. Claws on all four tarsi—i., ii., iii., and iv.—two only. *Anisaspis*, Sim.

Genus Actinopus, Perty, 1833.

(Type, *A. tarsalis*, Perty.)

Actinopus wallacei[2], n. sp. (Plate XXXV. fig. 18.)

♀. *Hab.* Santarem. Type in coll. Brit. Mus. Nat. Hist. 1896.

Colour.—*Carapace* pale testaceous brown, cephalic area darker. Base and centre of thoracic area pale testaceous. Base of mandibles very dark brown, clothed along the ridge and over the apex

[1] The specific name under which the type is described in *op. cit.* is "*tuberculata*," not "*bacillifera*" as quoted, no doubt by an oversight, in Hist. Nat. Ar. 1892, i. 1, p. 78.

[2] I have much pleasure in connecting this species with the name of Mr. W. Wallace (senior), of Santarem, through whose courtesy I was enabled to spend a fortnight in the heart of the forest, lodging in his plantation at the Sitio Andirobal.

with long pink hairs. *Abdomen* pale ochre-yellow, almost naked, clothed with fine short scattered hairs. *Sternum* pale testaceous; labium, coxæ of legs and pedipalp, and upperside of legs darker; underside of legs paler testaceous.

Carapace 8 mm. long; 7 mm. broad; 3 mm. wide at base. Cephalic area very prominent and raised above the thoracic area; broad in front, narrowed and compressed behind, with a deep impression on either side. Thoracic area bilobate behind, with a deep impression on either side towards basal angles. Anterior row of eyes slightly procurved; centrals very small, two diameters apart, six from laterals. Lateral anteriors within one transverse diameter from margin of clypeus. Anterior row very slightly wider than posterior. Central posteriors reniform, their axis usually distinctly longer than diameter of posterior laterals; rather over one transverse diameter from the latter. (These proportions are variable.) Base of mandibles with a *râteau* in front, furnished with numerous spicules. *Fang-groove* armed with 4 stout teeth on the outer margin, 6 on the inner, with intermediate cusps between the two rows.

Sternum, including labial plate, 7 mm. long, 4 mm. broad. Five pairs of sigilla clearly marked: 1st pair at base of labium, on either side; 2nd pair at base of labium behind, coalesced to form a deep longitudinal furrow; 3rd, 4th, and 5th longitudinal; central convergent, far remote from margin, coalescing to form a deep central depression. *Spinners* four, posterior pair three-jointed; basal joint longest, terminal very short, tuberculate. *Labial plate* not distinct from rest of sternum; longer than broad, its apex studded with a few minute cuspules. *Coxa of pedipalp* as long as broad; its anterior distal angle produced; anterior basal angle and whole of inner margin of disc studded with minute cuspules. Patella armed on outside with 2 small distal spines, on inner side with 5 or 6 long spines; tibia and tarsus armed on both sides with numerous longer and shorter spines.

Legs. Tarsus and protarsi i. and ii. armed on outer sides with numerous spines. Tibia i. with one or two minute spines or none on inner side; outer side with a few. Tibia ii. with none on inner side; with numerous spinules on outer side. Patella and tibia iii. with numerous spines on either side and along the anterior margin at apex. Protarsus and tarsus iii. with numerous spinules on either side. Patella iv. with numerous spines on outer side, and 5 or 6 along apical outer margin; protarsus iv. with one or two at apex; tarsus iv. with several on either side.

Measurements in millimetres.—Carapace 8 long, 7 broad. Total length, including base of mandibles, 25. Sternum, including labial plate, 7 long, 4 broad. Pedipalp 15 long. Legs i. 16, ii. 16, iii. 16·5, iv. 20 long: all from base of coxa.

Two specimens (♀) were taken from the sand on the campo close to Santarem, while digging out a tube of *Santaremia pococki*; and a little later a colony of about twenty was found on the same campo, nearer the forest. These, all females, had constructed

their tubes, six or eight inches long, silk-lined, with hinged doors at the entrance, in the sides of a large termite mound, whose damp walls afforded exactly the locality needed for such nests. No males were taken.

The following species have been described which probably belong to the same genus:—

Actinopus tarsalis, Perty, Del. Anim. Art. 1833, p. 39, fig. 6. Brazil.

A. rufipes (Lucas), ♀ (sub *Pachyloscelis*), Ann. Soc. Ent. Fr. 1833, p. 361. Brazil.

A. scalops (Sim.), ♀, ceph. 10 mm. long. (sub *Pachyloscelis*), Ann. Soc. Ent. Fr. 1889, p. 176. Venezuela.

A. caraïba (Sim.), ♀, ceph. 9·5 mm. long., Ann. Soc. Ent. Fr. 1889, p. 175. Caraccas; Venezuela.

A. valencianus (Sim.), ♀, ceph. 5·3 mm. long. (pullus), Ann. Soc. Ent. Fr. 1889, p. 177. Valencia, Venezuela.

A. rojasi (Sim.), ♀, ceph. 7 mm. long. (non plane adulta), Ann. Soc. Ent. Fr. 1889, p. 176. Caraccas; Venezuela.

A. longipalpis, C. K., ♂, Die Arachniden, ix. p. 102, pl. cccxxiv. fig. 754. Montevideo. (Type in coll. Mus. Berlin.)

A. nattereri, Auss., ♀ (Doleschall in MS.), Verhandlungen &c. 1871, p. 139. Rio Negro.

A. liodon, Auss., ♂, Verhandlungen &c. 1875, p. 142. Uruguay. (Type in coll. Brit. Mus. Nat. Hist.)

A. crassipes (Keys.), ♀, Spinnen Amer. iii. p. 3, pl. i. fig. 1. Taguara, Rio Grande do Sul. (Type in coll. Brit. Mus. Nat. Hist.)

A. luteipes (Keys.), ♀ (immature), Spinnen Amer. iii. p. 5. Rio Janeiro. (Type in coll. Brit. Mus. Nat. Hist.)

A. insignis, Holmberg, Ann. Soc. Argent. xi. p. 171, 1886. Argentine Republic.

A. piceus, Auss., ♂, Verhandlungen &c. 1871, p. 139. Locality unknown.

A. hartii, Poc., ♀, Ann. Mag. Nat. Hist. ser. 6, vol. xvi., Aug. 1895. Trinidad. (Type in coll. Brit. Mus. Nat. Hist.)

The following table may be of some assistance in distinguishing the females of the seven species of which we have adequate descriptions or type specimens.

The value of the characters, however, especially those drawn from the eyes, entirely depends upon the number of specimens compared before the character fixed upon was set down, and for this of course I cannot be responsible.

Out of thirteen examples of *A. wallacei* (♀) in all stages of development, I find that the central posterior eyes are sometimes smaller, sometimes equal to, and sometimes larger than, the posterior laterals. Sometimes these are almost in contact with one another, sometimes two diameters apart. In the immature especially, the posterior centrals are closer to, and smaller than, the laterals. Amongst the adults, in *the majority*, but not in *all*, the axis of the central posteriors is longer than the diameter

of the lateral posteriors and 1½ a transverse diameter of the former from them. Taking another character—the spinulation of tibia i.: in some of these examples there are no spines, in some 1, in others 2 or 3; while in one case, tibia i. left side had 2 spines, tibia i. right side had none. The central anterior eyes are sometimes 2, sometimes 3 diameters apart; while the lateral anteriors vary greatly in their distance from the margin of the clypeus, in the immature being quite close [1].

Given, however, *plenty of examples* of each form, I have no doubt but that certain characters might be tabulated which would be *broadly true* of the various forms, but only then to be used with caution.

Of the three forms—*A. hartii*, *A. crassipes*, and *A. wallacei*—of which I have been able to compare the actual types, the form of the cephalic area furnishes a good differential character, while the spinulation of tibia i. furnishes another, and the form of the sternum a third. But of these species I have seen only five examples (females) of *A. hartii* and one (female) of *A. crassipes*. I venture to think that no satisfactory conclusions will be arrived at until arachnologists are willing to hand over all available material of a particular genus to some one or other who is prepared to take the trouble to thoroughly compare every specimen and tabulate the characters. At present there is confusion of tongues and hair-splitting disputation concerning the fraction of a difference in the distance between particular eyes, whereas the examination of a long series usually proves that these same disputed distances are themselves constantly variable quantities in the same form.

The table given below will probably need considerable modification when a long series of forms is subjected to examination.

A. Tibia i. with a series of 5–13 spines on inner side.	
1. Anterior row of eyes a little wider than posterior..	*A. caraïba*, Sim.
2. Anterior row of eyes not wider than posterior.	
a. Tibia i. with 5–6 spines on inner side; tibia ii. without spines on inner side	*A. scalops*, Sim.
b. Tibia i. with 9–13 spines on inner side; tibia ii. with 1–3 spines on inner side	*A. hartii*, Poc.
B. Tibia i. without any spines, or with 1–3 only on inner side.	
I. Central posteriors smaller than laterals.	
1. Central posteriors scarcely smaller than laterals.	
a. Tibia i. with three small spines on inner side.	*A. crassipes*, Keys.
b. Tibia i. without any spines on inner side	*A. rojasi*, Sim.
2. Central posteriors much smaller than laterals...	*A. valencianus*, Sim.
II. Central posteriors reniform, larger than laterals.	*A. wallacei*, mihi.

The characters of *A. hartii* and *A. crassipes* have been taken from the types; the characters of the other species are taken from M. Simon's descriptions (Ann. Soc. Ent. Fr. 1889, pp. 176–177). They must, however, be used with caution.

[1] Mr. Pocock has observed similar differences in the characters at different stages of *A. hartii*, Ann. Mag. Nat. Hist. ser. 6, xvi. p. 195.

A. luteipes, Keys., of which I have examined the type (a young female), appears to me to be undoubtedly the young of *A. crassipes*, Keys.; the form of the cephalic area, broad behind and only slightly impressed at the sides, is very characteristic of the latter, and agrees in this respect with *A. luteipes*, Keys.; whereas in *A. hartii* and *A. wallacei* the cephalic area is much narrowed behind and deeply impressed on either side.

Of *A. tarsalis*, Perty, *A. rufipes* (Lucas), and *A. nattereri*, Auss. (Dol. in MS.), females, I will not venture to speak; nor can I deduce any satisfactory characters from those given by Ausserer.

Of the males, of which I have examined only *A. liodon*, Auss., I am at present unwilling to speak; the other males are *A. longipalpis*, C. K., and *A. piceus*, Auss.

One would not be inclined to attach too great value to the characters of *A. valencianus*, Sim., seeing that the specimen is evidently quite young ("*pullus*," sec. Simon).

Genus Acanthodon, Guérin.

Type. *Acanthodon petitii*, Guérin (♀), Rev. Zool. Soc. Cuv. 1838, p. 10. In coll. Brit. Mus. Nat. Hist. (Plate XXXIV. figs. 9, 10, 11, 12.)

This specimen, now upwards of sixty years old, is still in existence. A short description of its remains may be useful.

Carapace 10·75 long., 9 lat.; cephalic area two-thirds the length of carapace, gibbous, and slightly bilobate, depressed towards the clypeus. Width (longitudinally with respect to carapace) of ocular tumulus equal to distance from posterior margin of posterior row of eyes to the posterior margin of anterior row of eyes. Its length one and a half times its width. *Eyes*. Anterior centrals half a diameter apart; posterior centrals three diameters apart, nearly two diameters from posterior laterals; one and a half or even more from anterior centrals. Anterior laterals set on a low, bilobate tubercle, half a diameter apart, distant from the anterior centrals a space equal to width of the ocular tumulus, from anterior margin to posterior margin. *Fovea* deep, procurved. *Mandibles* with the rastellum consisting of numerous stout teeth. Fang-groove armed with a row of 8 stout conical teeth on the inner margin; 5 smaller ones on the floor, opposite nos. 5–8 of inner row, near the outer margin, which is fringed with coarse rufous hairs.

Sternum too damaged to furnish any useful character. *Labium* longer than broad, slightly narrower towards apex, furnished with a single central transverse pair of cusps. *Coxa of pedipalp* twice as long as broad, furnished with numerous cusps on the anterior apical and basal angles, besides others studded on the anterior surface. *Tarsi* three-clawed; superior pair armed with a single denticle towards the base. Tarsi and protarsi i. and ii. cuspidate on either side. The spinners are almost obsolete through age, and several of the legs are missing.

ACANTHODON SANTAREMIA, n. sp. (Plate XXXIV. fig. 13.)

♀. *Hab.* Santarem, Lower Amazons. 16 mm. long. Type in coll. Brit. Mus. Nat. Hist.

♀.—*Colour.* Carapace dull orange-brown; mandibles the same, darker towards apex. Sternum and legs also dull orange-brown; tarsi slightly darker. Abdomen dull olive-brown; spinners paler.

Carapace a little longer than broad; cephalic area more than half as long as carapace; strongly gibbous immediately in front of central fovea, slightly bilobate longitudinally, gradually depressed to margin of clypeus. Cephalic and thoracic indentations short but deeply impressed, especially the posterior pair. Central fovea deep, procurved. Margin of carapace raised and sinuous towards base, the latter truncate.

Eyes in two separate groups. Anterior laterals circular, situated on a bilobate tubercle at the margin of the clypeus; less than half a diameter apart. Anterior centrals and posteriors situated on a low tumulus, two full diameters of the former behind the anterior laterals. Anterior centrals circular, half a diameter apart, not quite one diameter from lateral posteriors; the latter ellipsoidal, very narrow, and pointed behind. Posterior centrals two full diameters apart, nearly one diameter from posterior laterals, half a diameter from anterior centrals. Posterior row only slightly procurved.

Mandibles furnished with a rastellum formed of numerous stout conical teeth projecting beyond the apex. Fang-groove fringed on both sides with rufous hairs; inner margin armed with a row of eleven irregular stout teeth. Floor of fang-groove studded with a short row of five small teeth opposite nos. 7 and 11 of the inner row.

Labium as broad as long, narrowed towards apex, bears two stout cusps situated transversely in the centre. *Coxa of pedipalp* double its breadth; anterior apical angle slightly produced and armed with a cluster of 5 or 6 stout cusps. Anterior basal angle armed with a curving row of 5 or 6 cusps, while the whole inner surface is studded with numerous small cusps.

Sternum longer than broad, convex, smooth, set with stiff, black, scattered hairs. Sigilla i., ii., and iii. present; the first two marginal and indistinct, the latter submarginal, distinct, and situate opposite the coxa of the second pair of legs.

Legs 4, 1, 3, 2. Femora without spines; tibia, protarsus, and tarsus of first pair armed with cusps on both sides, more numerous on the outer side. Tibia ii. armed with numerous cusps on inner margin only, with two long spines and two minute cusps only on outer margin. Protarsus ii. with numerous cusps on the inner side; on the outer several cusps and three short, stout spines, in a longitudinal row, beneath. Tarsus ii. armed on both sides with cusps. Tibiæ iii. and iv. without spines or cusps. Patella iii. with cusps on outer side; protarsus iii. with spines and cusps, on either side, above; and below in a series of 2—2—2. Tarsus iii. with a few short cusp-like spines on either side. Patella and

tibia iv. without any cusps or spines. Protarsus and tarsus iv. with a few spines beneath. *Pedipalp.* Femur and patella without cusps; protarsus and tarsus armed with numerous marginal cusps on either side. Tarsal claws three, on pedipalp one only, superiors armed with a small single denticle towards the base beneath. No scopula at all present.

Spinners four; posterior pair very short, less than one quarter as long as abdomen. Second joint half the length of basal; terminal half the length of the second. Anterior pair half the length of basal joint of posterior, one diameter apart, not closely contiguous.

Comparative measurements in millimetres.—♀. Carapace 7 long., 6 lat. Abd. 9 long., 6 lat. Ceph. area 4 long. Coxa of pedipalp 2·5 long., 1·5 lat. Stern. 4 long., 3·5 lat. Pedes, long. i. 17—ii. 15—iii. 16—iv. 21. Artl. i. long. 2·5—1—5—2—3—3. Artl. iv. long. 2·5—1—5·5—2—4—3·5—2. Posterior mam. 2 long.; artl. 1—·5—·25. Ant. mam. ·5 long., ·25 apart. Mandib. 3 long.

A single specimen of the female sex was taken by myself amongst fallen mango-leaves in a clearing in the forest of Santarem in March 1896.

Species already described from the Neotropical Region.

Of the various species of *Idiops* which have been already described from South America, some of them possibly belonging to the genus *Acanthodon*, the following appear to me to be quite different from *A. santaremia*.

Idiops rohdei, Karsch (♀), Berl. ent. Zeit. xxx. p. 93. ♀, long. 16 mm. *Hab.* Paraguay?—Although most of the characters given in this diagnosis are common to the whole genus, the statement "labio ad apicem irregulariter denticulato" certainly does apply to my species.

Idiops fuscus, Perty (♂), Delect. Anim. Art. 1833, p. 197, tab. 39. ♂. *Hab.* Piauhi, Brazil.—The position of the eyes—"oculi 8: 2 antici, 2 majores medii, et pone hos 4 in lineam curvam dispositi"—is not the same as in *A. santaremia*.

Idiops argus, Sim. (♀), Ann. Soc. Ent. Fr. 1889, p. 180. ♀, long. 16 mm. *Hab.* Venezuela.—The description of the labium, "Pars labialis ad apicem spiculis 5–6 minuta," clearly excludes my species.

Idiops fulvipes, Sim. (♀), Ann. Soc. Ent. Fr. 1889, p. 181. ♀, long. 8 mm. *Hab.* Venezuela.—Of this species Simon says "Præcedenti valde affinis," referring to *I. argus*, Sim.; and since he does not refer to the armature of the labium, one must infer that it is similar to that of the closely allied form.

Idiops bonapartei, Van Hasselt, Tijdschr. Ent. xxxi. 1888, p. 166. ♀, long. 14 mm. *Hab.* Surinam.—"Labium serie transversâ 7-denticulorum armatum." *A. santaremia* has but 2.

Idiops germani, Sim. (♂), Hist. Nat. Ar. 2nd ed. i. 1, p. 92

(1892). ♂, long. 14 mm. *Hab.* Rio, Brazil.—Of this species Simon says:—"Tarsi cuncti subtus scopulati," and also "Partes oris....(omnino muticæ)."

Genus Homœoplacis, E. Simon.

Type. *H. pentodon*, E. Simon (♀), Ann. Soc. Ent. Fr. 1892, p. 275. ♀ 11·8 long. *Hab.* Brazil, S. Paulo de Olivença.

Homœoplacis austeni, n. sp. (♂)[1]. (Plate XXXIV. figs. 14, 15, 16 *a* & *b*.)

♂. *Hab.* Manãos, Lower Amazons. 12 mm. long. Type in coll. Brit. Mus. Nat. Hist.

♂.—*Colour.* Carapace, sternum, and legs dull orange-brown. Abdomen mouse-grey.

Carapace marked on the caput with three dark longitudinal lines, the central narrower, with a central and two lateral series of stiff curving black bristles. Thoracic area with converging lines of black bristles. Central fovea deep, procurved. Margin of carapace fringed with stiff curving black bristles.

Abdomen shorter and narrower than carapace, clothed with dark mouse-grey pubescence and black hairs. *Spinners* four; pale straw-yellow; shorter than abdomen. Posterior pair three-jointed, with pseudo-joint at base; basal joint longest, middle joint half its length, terminal much shorter, globular. Anterior pair half the length of basals of posterior pair, almost contiguous. Mandibles brown; sternum pale straw-yellow, furnished with black hairs.

Carapace longer than broad; cephalic area less than two-thirds the length of carapace; central fovea deep, procurved.

Ocular tumulus low, quadrate, narrower in front. Eyes opaline, set in a black ground. Anterior centrals large, half a diameter apart, not larger than anterior laterals, these being in front and close to the margin of the clypeus, half a diameter apart. Posterior laterals a little smaller than anterior centrals, and nearly one diameter from them. Posterior centrals very small, one diameter from anterior centrals, half a diameter from posterior laterals.

Mandibles dark brown, furnished at apex with a *râteau* formed of five long stout teeth or modified hairs. Fang-groove fringed on the outer side with a dense line of bright rufous hair; the inner margin furnished with a row of 8 stout conical teeth; the floor towards the base studded with a very few minute cusps.

Sternum longer than broad. Sigilla i., ii., iii., iv. present, marginal, the last three pairs scarcely noticeable.

Labium broader than long, globular, not furnished at its apex with cusps.

[1] I have much pleasure in associating this species with the name of Mr. H. H. Austen, to whom I am indebted for calling my attention to the specimen when collecting together near Manãos

Coxa of pedipalp three times its breadth, not produced at anterior angle; bearing on the inner basal angle three sharp black cusps set in a curving row.

Legs 4, 1, 2, 3, clothed with fine rufous hairs, black curving bristles, and black spines. Tarsi i. and ii. with two claws and a claw-tuft; claw armed with a minute denticle rather before the middle, beneath; scopulate. Tarsi iii. and iv. with two claws and a claw-tuft, the claws bearing no denticle; very slightly clothed beneath with scattered scopuliform hairs. Protarsi i. and ii. with slight scopula at apex and two stout spines, one apical, the other basal, beneath; iii. and iv. with numerous spines. Tibia i. bearing at its apex on the inner side, beneath, a pair of stout curved spines set in juxtaposition to each other, with five ordinary spines, 2—1—3 beneath, and one on the inner side. Tibia iii. and iv. with numerous spines. Femora of all four pairs with five or six spines above.

Pedipalp. Femur with a few spines at apex above. Tibia fringed on either side beneath with long hair, and six spines on the inner side, two on the outer. Tarsus short, half the length of tibia. Bulb short, pyriform, transverse, its stylum very short, curved, directed outwards and backwards.

Comparative measurements in millimetres.— ♂. Carap. 6·5 long., 5·5 lat. Abd. 5·5 long., 3·5 lat. Ceph. area 4 long. Stern. 3·25 long., 2·5 lat. Coxa of pedipalp 2·5 long., 1·25 lat. Pedes, long. i. 25—ii. 23—iii. 20—iv. 30. Artl. i. long. 3·25—1·25—6·5—3—5·5—4—3. Artl. iv. long. 3—1—7·5—2—6—8·5—2·5. Postr. mam. long. 3·5; artl. 1·5—1—·5. Antr. mam. ·75.

My attention was called to a fine specimen, an adult male, of this species by Mr. E. E. Austen when collecting in the neighbourhood of Manãos, Amazonas, in February 1896, and I have great pleasure in connecting his name with the species. The generic characters which distinguish *Homœoplacis* from *Barychelus* are well marked. Cephalic fovea procurved; rastellum at apex of mandible consisting of five separate teeth; coxa of pedipalp armed near the base with only a few (3–4) small cusps; ocular tumulus narrower in front.

M. Simon apparently does not know the male of the species he has made the type of his genus, so that no mention is made of the spines at the apex of the tibiæ of the first pair of legs.

Species described.—*H. pentodon*, Sim. op. cit. p. 275.

It is possible that the Spider described above may be the male of the one described by Simon; but it is not easy to identify a specimen of this sex from a description of the female. He says of it—"Parte cephalica vittis duabus;" of *H. austeni* one would rather say—"Parte cephalica lineis tribus;" and again he says: "parte thoracica lineis radiantibus, lineaque marginali obscurioribus notatis"; whereas in my specimen there are no radiating lines and no marginal dark line.

Genus Acanthoscurria, Ausserer, 1871.

Syn. 1842. *Mygale*, C. Koch, Die Arachniden, ix. p. 43, fig. 718.
1850. *Scurria*, C. Koch, Uebersicht, v. p. 74.

Type. *A. geniculata* (C. K.), ♂. In coll. Imp. Mus. Berlin. *Hab.* America.

Generic Characters.

Legs spinose. Patella and tibia iv. *shorter, or not longer than patella and tibia* i. *Tibia* i. *of* ♂ *armed with a single spur at apex. Anterior row of eyes more or less slightly procurved. Femora* iv. *clothed on inner side with thick short soft hairs, forming a velvety pad. Sternal sigilla visible—1st pair at base of labium; 2nd marginal; 3rd submarginal; 4th remote from margin.*

Acanthoscurria geniculata (C. Koch). (Plate XXXIV. fig. 17.)

♀. *Hab.* Santarem. In coll. Brit. Mus. Nat. Hist. 1896. Length 70 mm., including base of mandibles.

♀.—*Colour.* Carapace mahogany-brown, clothed with short grey velvety pubescence. Clypeus fringed with yellow-pink hairs. Mandibles black, clothed with short grey hairs and long rufous-pink hairs. Abdomen black, velvety, clothed with long rufous-pink hairs; black, velvety, beneath. Sternum and coxæ of legs deep black-brown. Coxæ of pedipalp and labium pale red-brown; inner margins fringed with fiery-red hairs and long rufous hairs. *Underside* of legs black-brown, clothed with long rufous-pink hairs, the distal end of each segment fringed with cream-pink hairs. *Upperside*: femora black, with grey pubescence, outer side fringed with long rufous-pink hairs. Patella, tibia, and protarsus and tarsus of i., ii., iii., iv. rich black-brown; the distal end of each segment and of the femur broadly tipped with short creamy-pink hairs, forming a richly contrasting annulation. Patella and tibia i. and ii., less so of iii. and iv., marked with a pair of longitudinal rufous-pink lines of short hairs. Protarsi i., ii., iii., iv. with a short basal central rufous line. The pedipalp is similarly marked. The legs are everywhere clothed with long silky rufous-pink hairs.

Carapace 26 mm. long, 24 mm. broad; gibbous behind eyes, with a depression on either side. Central fovea small, slightly recurved. *Eye-tumulus* longer than broad (more so than in *A. brocklehursti*). Centrals a full diameter apart, nearly a diameter from the laterals; their diameter distinctly less than axis of anterior laterals. Anterior row of eyes more strongly procurved than in *A. brocklehursti*. *Mandibles* 15 mm. long. Fang short, only slightly incrassate in middle below; fang-groove armed with a single row of teeth on inner side, fringed on both margins with fiery-red hairs, thickly on outer side, more thinly on inner side. *Sternum* 15 mm. long, 10 mm. broad; elongate oval. Four pairs of sigilla visible: 1st at base of labial plate; 2nd marginal; 3rd submarginal; 4th

remote from margin. *Labium* longer than broad, its apex studded across entirely with cuspules. *Coxa of pedipalp* more than twice its breadth; anterior distal angle produced; anterior basal angle studded with cuspules, more scattered and fewer towards disc.

Legs spinose; fourth pair longest. Tarsi and almost the whole of protarsi i. and ii. thickly scopulate; of iii. tarsus and half protarsus, of iv. distal end, of protarsus slightly, and tarsus, scopulate. Femur iv. with velvet pad on inner side. Tarsal claws 2; inner claw with 7, outer with 3 denticles, of first pair of legs. *Spinnerets* 4; posterior pair a little less in length than tibia i.

So far as I am aware, the female of this magnificent Spider has never been fully described, and the specimen taken is the first of this sex which has come into the possession of the British Museum of Natural History. *A. geniculata* is apparently not a rare Spider in the Amazonian forest. One female was found by Mr. Austen in a hollow tree at Breves, but we were unable to secure it. I saw, also, more than one far down in the burrows of the Termites, underground, where it was useless to attempt a capture. The young ones to the number of a hundred or more crowded the entrance to one of these dens, running about over a broad thin sheet of webbing. The specimen described was, however, taken by myself from the hollow branch of a tree which had fallen in the forest near Santarem, the only one I was able to secure.

Its presence was first detected by the slight white web spun over the end of the short decayed hollow stump, while far down within could be seen the pale banded legs of the spider. Fortunately—whether it is always the case or not I cannot say—there was also a bolt-hole, so that, after rattling with a stick down the hollow, out burst the spider with a strange rustle and pattering of its padded feet. Had it not been for the noise, I should probably not have noticed it, for I never suspected an exit at the other end.

With gloved hand in front and large prune-jar held open behind her, she stopped, but made no attempt to attack or bite at the obstacle in front. But now, when pressed, with lightning speed she whisked off a small cloud of fine down from the back of the abdomen on the upperside with the claws of the fourth pair of legs. Pressing her in front, she went backwards into the jar, and at once was secured. Mr. Bates mentions the poisonous character of the hairs of these great Spiders, he himself having suffered from them; and one has often observed a bare patch on the upperside of the abdomen, at its apex, of many of them, whence the fine pubescence has been apparently rubbed off. Putting these two links together, and connecting them with the action which I witnessed, I am convinced myself—though I should need far more proof before I would definitely assert that such was really the case—that the spider whisks off these fine hairs in order to protect itself. It is true that, though I caught upwards of 150 large Spiders, I never saw *one*, except the above, act in this way,

though the *Aviculariæ* certainly scarcely had a chance, for I usually caught them under a handkerchief or glove, when the legs could not be used in the way described above. Still it is quite possible that they also act in the same way, for the abdomen of *Avicularia* was in many cases entirely devoid of pubescence. *Santaremia pocockii*, however, had plenty of chances, but never made use of this method of defence, so far as I observed, nor were their abdomens in any case bare of pubescence.

This handsome Spider is probably the Bird-eating Spider described and figured by Bates in his 'Naturalist on the Amazons,' though I found nothing save beetle relics (Longicorns chiefly) in the bottom of the hollow where *A. geniculata* lived. So far as I know no account of the whisking off of irritating hairs by *A. geniculata* or any "Mygale" has ever been published, if ever observed.

There can be little doubt but that the *A. geniculata* here described is identical with the specimen in the Berlin Museum. This, a male, has been figured by Koch, and a male specimen in the British Museum of Natural History agrees well with the figure. The annulations on the legs are its chief characteristic. Whether Ausserer saw the type male or not, I cannot say, but he may have taken his descriptions from Natterer's specimen from the Rio Branco, Brazil. The female of this species is an addition to the National collection.

ACANTHOSCURRIA BROCKLEHURSTI, n. sp. (Plate XXXIV. fig. 18.)

♀. *Hab.* Para. Type in coll. Brit. Mus. Nat. Hist. 1896. Length 60 mm., including base of mandibles.

♀.—*Colour.* Carapace deep brown, clothed with grey-brown velvety pubescence. Margin of clypeus fringed with fine pink-tipped grey hairs. Base of mandibles thickly clothed with short grey pubescence and longer scattered rufous hairs. Abdomen clothed with deep brown velvety pubescence and long scattered rufous hairs; ventral surface velvet-black. Sternum and coxæ of legs velvety, clothed with rich chocolate-brown pubescence. Labium and coxa of pedipalp pink, clothed with long pale-orange hairs, inner margin fringed with fiery-red hairs. Underside of base of mandibles pink; margins of fang-groove fringed with fiery-red hairs. Legs clothed entirely with rich chocolate-brown pubescence and long scattered rufous hairs, apex of each segment fringed with short cream-pink hairs. Patellæ of i., ii., iii., and iv. exhibiting two longitudinal lines of short rufous hairs.

Carapace 22 mm. long, 20 mm. broad; gibbous behind eyes, with a depression on either side. Central fovea deep, transverse-procurved. *Eye-tumulus* a little longer than broad, oval, prominent. Anterior row of eyes almost straight, procurved; centrals scarcely one diameter apart (a little less from laterals), their diameter distinctly greater than axis of laterals. *Mandibles* 13 mm. long. Fang short, incrassate about the middle. Fang-groove with a row of teeth along inner margin; both margins fringed with red hairs, outer thickly, inner thinly. *Sternum*

11 mm. long, 7 mm. broad, elongate oval; with four pairs of sigilla visible—1st pair at base of labial plate, 2nd marginal, 3rd submarginal, 4th remote from margin. *Labium* broader than long, apex armed along its entire width with cuspules. *Coxa of pedipalp* scarcely twice its width; anterior distal angle slightly produced; anterior basal angle armed with cuspules, becoming fewer and more scattered towards the disc.

Legs spinose; fourth pair longest. Tarsi and three-fourths of protarsi i. and ii. scopulate; of iii. tarsi and half protarsi, of iv. tarsi and very slightly at the apex of protarsi, scopulate. Femur iv. with velvet pad on inner side. Tarsal claws 2; inner with 7 denticles, outer with 6. *Spinners* 4; posterior pair as long as tibia ii.

This species is very much smaller than *A. geniculata*, from which it differs, first in the relative length of the first and fourth pairs of legs, secondly in the proportion of the anterior eyes. Its tarsi and protarsi, too, are much less broadly padded with scopular hairs.

A single female from Pará; from a native palm-thatched hut.

I have much pleasure in connecting this fine species with the name of Mr. Brocklehurst, to whom we are indebted not only for this specimen and many others, but also for great courtesy in rendering every assistance in his power to further the success of the expedition. This species is an addition to the National collection.

The following species have been described and their differential characters diagnosed by M. Simon (Ann. Soc. Ent. Fr. 1892, p. 280):—

A. musculosa, E. Sim., ♂, op. cit. p. 281. San Mateo, Bolivia (*Garlepp*).

A. maga, E. Sim., ♂, op. cit. p. 280. America Meridionalis.

A. minor, Auss., ♂, Verhandlungen &c., 1871, p. 206. Guiana.

A. insubtilis, E. Sim., ♂, op. cit. p. 282. San Mateo, Bolivia (*Garlepp*).

A. ferina, E. Sim., ♂, op. cit. p. 282. Teffe, Amazonas.

Genus Avicularia, Lamarck, 1818.

Avicularia, Lamarck, Anim. sans Vert. v. 1818, p. 107.

Syn. *Aranea*, Linnæus; DeGeer; Kleemann (in part).

Mygale, Latreille; Walckenaer; Hahn; Lucas (in part).

Type.—Figures of two males in 'Dissert. Gen. Metamorph. Insect. Surinam.' pl. xiii. (1726): Madame M. S. Merian.

Generic Characters.

Anterior row of eyes strongly procurved. Legs of first pair shorter than those of fourth. Four pairs of sternal sigilla visible—1st at base of labial plate; 2nd marginal; 3rd marginal; 4th submarginal. Posterior pair of spinners longer than width of sternum. Carapace nearly straight (in profile) behind the eyes. Patella and tibia iv. *longer than carapace. Protarsus and tarsi* i., ii., iii., *and*

iv. *broad, spatuliform. Habits arboreal; forming silken cylinders in hollow trees or amongst foliage.*

AVICULARIA AVICULARIA (Linn.), 1758. (Plate XXXIII. figs. 10, 11; Plate XXXIV. fig. 19; and Plate XXXV. fig. 13.)

Probable synonyms.

1746. *Aranea avicularia*, Linn., Kleemann's Supplement to Rösel's Iconographie, i., pls. xi., xii.

1758. *Aranea avicularia*, Linn. ♂, Syst. Nat. ed. x. i. p. 622.

1764. *Aranea avicularia*, Linn. Mus. Ludovicæ Ulricæ, p. 428: based on figures in Madame Merian, *op. cit.*

1767. *Aranea avicularia*, Linn., Syst. Nat. ed. xii. p. 1034.

1778. [1] *Aranea vestiaria*, DeGeer, Mémoires, tom. vii. p. 313, pl. xxxviii. fig. 8.

1793. *Aranea avicularia*, Linn., Fabricius, Ent. System. ii. p. 424.

1804. *Mygale avicularia*, Latreille, Hist. Nat. d. Crust. vii. p. 152, pl. 62. 1.

1805. *Mygale avicularia*, Walckenaer, Tabl. d. Aran. p. 4.

1806. *Mygale avicularia*, Latreille, Genera Crust. i. p. 82.

1820. *Mygale avicularia*, Hahn, Monographie der Spinnen, pl. i. fig. 3.

1837. *Mygale avicularia*, Walckenaer, Hist. Nat. d. Ins., Apt. i. p. 217.

1842. *Mygale avicularia*, Lucas, Hist. Nat. Crust. &c. i. p. 335.

1848. *Mygale testacea*, C. K., ♂, Die Arachniden, ix. p. 45, pl. cccliii. fig. 719 [2].

1848. *Mygale scoparia*, C. K., ♀, Die Arachniden, ix. p. 54, pl. cccvi. fig. 725 [3].

1871. *Avicularia vestiaria*, DeGeer, Ausserer, Verhandlungen &c., Wien, 1871, p. 201.

1892. *Avicularia avicularia* (Linn.), Simon, Hist. Nat. Araign. i. p. 171.

AVICULARIA AVICULARIA (Linn.).

♀. *Hab.* Para.

Colour.—Carapace mahogany-brown, clothed with converging lines of short grey-green hairs. Sternum, coxa of pedipalp, and legs velvety black; inner margin of former fringed with fiery-red hairs. Abdomen and legs clothed with black hairs beneath, becoming rufous above; third and fourth pairs clothed with long,

[1] The name *vestiaria* was evidently not intended by DeGeer as a specific name, but was only used as a term in the description. Ausserer, however, did not notice this and regarded it as a specific name, although the name *avicularia* in any case has priority. Perhaps Ausserer considered it unadvisable to have both generic and specific name the same, and the legitimacy of this combination in practical nomenclature is still a matter of disputation amongst scients.

[2] This is possibly drawn from a faded specimen of *A. avicularia*, for Koch remarks that the figure is drawn from an old specimen.

[3] This figure is certainly similar in coloration to numbers of young *Avicularia* taken by myself in the neighbourhood of Para.

stiff, fiery-red hairs, especially the three terminal segments. Tarsi of all four pairs tipped with a broad bar of rufous hairs. Underside of tarsi of pedipalp, tarsi and protarsi of first and second pairs of legs, except extreme base of protarsi, tarsi and half the protarsi of third and the apex of protarsus of fourth pairs, furnished with a thick scopula. Tarsi of all four pairs and of pedipalp broad, spatuliform. Abdomen clothed on the sides with bright rufous, stiff and long hairs, these becoming obsolete towards the apex of abdomen above, disclosing an undercovering of short black hairs. Underside clothed with black hairs.

Carapace longer than broad, in proportion of 20:18; flat, not gibbous behind eye-tumulus. *Eye-tumulus* twice as long as broad, more or less prominent (variable). Anterior centrals one diameter apart, distant from anterior laterals a space equal to transverse diameter of latter. Anterior row only slightly procurved[1]. Central fovea deep, recurved. Fang-groove armed with a single row of short stout conical teeth, both margins fringed with long hairs; floor of groove studded with minute granules. *Sternum* with three pairs of sigilla visible—1st at base of labial plate, 2nd obsolete, 3rd marginal, 4th submarginal. *Labium* quadrate, its distal third entirely studded with minute cuspules. *Coxa of pedipalp* slightly more than twice its breadth; its inner basal angle studded with minute cuspules, as also is the basal inner disc, only more scattered; anterior inner angle produced, obtusely conical. *Legs* of fourth pair longer than those of first. Tarsus of pedipalp with *one*, of legs i., ii., iii., and iv. with *two* small stout hooked claws, their inner edges *plain*, not armed with denticles. *Spinning mamillæ* four; posterior pair trisegmental, second segment shortest. The whole three segments taken together one-third longer than width of sternum.

This is the form which is most abundant on the Amazons, occurring at Pará, Breves, Gurupa, Monte Alegre, Obydos, Santarem, &c., in almost any number and in all stages of development. Amongst the foliage the little yellow-legged immature of this species with black tarsi, the next stage with black oblique stripes on the abdomen, and many others, were in abundance. The adults constructed their tubular retreat in almost any locality which offered a more or less vacant cylindrical space. Of the hollow stumps of the Assai palm in the neighbourhood of Pará, which had been sawn off about 3 ft. from the ground, almost every one had its tenant. Further up the river, one found them in the folded leaves of bananas, and at Obydos and Santarem abundant in the half-grown condition in the hollow centre of the pineapple plant. Sometimes, too, their loose white irregular cylinder of

[1] In scarcely a single specimen are the eye-measurements the same, so inconstant and unreliable are characters drawn from the proportional size and separation of these organs. In some specimens the anterior row is much more strongly procurved, while the anterior laterals are distant from the centrals a space equal to the diameter of the latter.

silk, with one or more openings at the entrance, would be constructed amongst the palm-leaf thatch of the native houses.

The spiders would often be seen sitting near the tube on the outsides of the palm-stem, nor were they either very rapid in their movements or inclined to attack those who interfered with them; merely raising themselves on their hind legs in an attitude of defence.

I was not successful, however, in securing any clue to the nature of their food; no débris of any sort was to be found in the nest itself, nor did I even surprise one in the act of seizing or devouring its prey.

Males, too, were apparently very scarce, for not a single specimen of this sex was met with.

Beyond the raising themselves on the last two pairs of legs and striking with the mandibles, I noticed no habit worth mentioning. I might, however, call attention to the scrabbling, rustling, pattering noise made by the spider in running upon any dry substance. A pair of large *Avicularias*, striving to escape from an umbrella into which they have fallen from the banana leaves, make a most appalling noise. Such a noise is entirely unexpected from spiders whose feet are so well padded with soft hairs beneath; but whether the noise is made by the claws, which I doubt, or by the soft pad, which is difficult to believe, I am so far unable to decide.

AVICULARIA AVICULARIA VARIEGATA, subspecies nov. (Plate XXXIII. fig. 12, ♀.)

Hab. Itacoitiara, Lower Amazons.

Similar to the above in all respects except that the long hairs are grizzled with grey at the tips, and very thick, especially on the third and fourth pairs of legs. The apex of the tarsi, too, is tipped with a *narrow band of pink hairs*, while there is a noticeable and entire absence of the fiery-red hairs so characteristic of *Avicularia* on the legs. The abdomen, too, is clothed on the sides with long grizzled and delicate pink hairs, not fiery-red, while the whole body is of a delicate mossy-green tint, from the green-grey pubescence, harmonizing well with the foliage amongst which they live.

Of this beautiful variety I beat two specimens, females, into an umbrella from banana trees in the neighbourhood of Itacoitiara or Serpa, on the north bank of the Amazons, Feb. 7, 1896.

The most interesting point about these two varieties seems to be—judging of course entirely by the long series captured over a distance of a thousand miles inland on the Amazons—that as we went further west there began to be a tendency to grizzled hairs. One specimen in particular, taken from a banana tree in a clearing in the forest at Santarem, presents a distinctly intermediate character between these two extreme forms, the hairs of the first two pairs of legs being decidedly grizzled. It would have been very interesting to compare the males of the grizzled form, *variegata*, with males of the typical *Avicularia*; but fortune did not favour me in this respect.

One would be inclined to consider that possibly a separate species is in process of differentiation, and that the further westwards it extended the more decided might be the differential characters. Of course this is only a theory, as regards the latitudinal distribution of the forms, which would be at once upset by grizzled specimens from Pará, for instance. The difference, however, is so striking, that one would not hesitate to regard the grizzled form as decidedly a different species from the red, when alive in all the fresh beauty of its grey-green colouring; until careful comparison proves that the difference is, so far, but one of coloration, having apparently no structural counterpart.

Species which probably belong to the genus Avicularia.

1848. *Mygale hirsutissima*, C. K., ♀, Die Arachn. ix. p. 76. South America. In coll. J. Sturm, Nürnberg.

1848. *Mygale leporina*, C. K., ♂, Die Arachn. ix. p. 55. Bahia. Mus. Berlin.

1848. *Mygale diversipes*, C. K., ♀, Die Arachn. ix. p. 65. Brazil. Mus. Berlin.

1848. *Mygale læta*, C. K., ♀, Die Arachn. ix. p. 66. Porto Rico. Mus. Berlin.

1848. *Mygale cæsia*, C. K., ♀, Die Arachn. ix. p. 88. Porto Rico. Mus. Berlin.

1848. *Mygale detrita*, C. K., ♂, Die Arachn. ix. p. 86. Brazil. Mus. Munich.

1848. *Mygale walckenaerii*, Perty, Del. An. Artic. p. 191, t. 38. 2. Brazil.

1871. *Avicularia vulpina*, Auss., Verhandlungen &c., Wien, 1871, p. 202. Brazil.

1876. *Avicularia rutilans*, Auss., ♂, Verhandlungen &c., Wien, p. 184. New Granada.

1876. *Avicularia metallica*, Auss., Verhandlungen &c., Wien, p. 185. Surinam.

1889. *Avicularia velutina*, Sim., ♀, Ann. Soc. Ent. Fr. 1889, p. 213. Venezuela.

1890. *Avicularia holmbergii*, Thor., Ann. Mus. Genov. (2) viii. p. 399. Hab.?

1891. *Avicularia glauca*, Sim., ♂, Ann. Soc. Ent. Fr. 1891, p. 312. Panama.

Genus Tapinauchenius, Ausserer, 1871. (Plate XXXIV. fig. 21.)

Syn. 1842. *Mygale*, C. Koch, Die Arachniden, ix. p. 67.
1850. *Eurypelma*, C. Koch, Uebersicht.

Type. *T. plumipes* (C. K.), ♂, Die Arachniden, ix. p. 67, tab. cccxi. fig. 733, 1842. In coll. Mus. Imp. Berlin.

Generic Characters.

Anterior row of eyes straight or nearly so. Legs of first pair equal to those of the fourth. Three pairs of sternal sigilla visible—1st at

base of labial plate; 2nd almost obsolete; 3rd marginal; 4th submarginal. Posterior pair of spinners a little longer than width of sternum. Carapace quite straight (in profile) behind eyes. Patella and tibia iv. *equal to length of carapace. Patella and tibia* i. *equal to length of carapace. Legs clothed with long hairs; feathery. Protarsus and tarsi* i., ii., iii., *and* iv. *broad, spatuliform. Habits arboreal; forming silken cylinders under bark of trees or amongst foliage.*

Never having seen the type specimen of *M. plumipes*, C. K., one cannot speak with absolute confidence as to its generic characters. Specimens of *T. sancti-vincenti*, Walck., however, agree remarkably with the full figure of *M. plumipes* and in the arrangement of the eyes which C. Koch has given, and there can be little doubt but that the two forms are congeneric. As distinct from *Avicularia*, they may be recognized by the anterior eyes forming an almost straight row, whereas in *Avicularia* they form a strongly procurved line. In *Avicularia* the fourth pair of legs is the longest; in *Tapinauchenius* the first and fourth pairs are equal [1]. Tibia and patella iv. are, in *Avicularia*, longer than the carapace; in *Tapinauchenius* they are equal to it. The posterior pair of spinners in both these genera are longer than the width of the sternum. Otherwise in general characters the species of these two genera are very much alike; the anterior row of eyes, however, furnishing the best character—so far as one can judge from the material in hand.

Mygale sancti-vincenti, Walck., ♂, Insectes Aptères, i. p. 216.—Walckenaer says: "La quatrième et la première paire de pattes sont presque égales"—"les yeux forment un carré long, transverse, dont la gibbosité est peu prononcée." The generic characters given above of *Tapinauchenius* have been drawn from specimens of this species.

Cf. E. Simon, Proc. Zool. Soc. 1891, p. 553. St. Vincent.

Species probably belonging to this genus hitherto described:—

T. latipes, Auss. Verhandlungen zool.-bot. Gesel. 1876, p. 183. Venezuela.

T. reduncus, Karsch, Zeit. ges. Naturwiss. p. 387, vol. liii. Costa Rica.

Of *Tapinauchenius*, M. Simon says:—"Les mœurs de ces

[1] M. Simon in Proc. Zool. Soc. 1891, p. 583, gives the lengths of the first and fourth pairs of legs in *T. sancti-vincenti* (♀) as i. 46·2 mm., iv. 48·5 mm. In this measurement the coxa is evidently not included; if the coxa is included, the lengths of i. and iv. are equal, namely, 59 mm. But of course there is no special value in the *absolute* lengths; nor must such characters be held as absolutely reliable. In an *Avicularia*, ♂, n. sp. undescribed, for instance, and in *A. rutilans*, Auss., ♂, again, the first pair of legs is equal to, or, if anything, slightly longer than, the fourth, instead of *vice versâ*. Whether this character may ultimately prove to be more than of specific value or not, one would at any rate not regard it of *sectional* value as M. Simon does (Hist. Nat. Ar. i. p. 133). Many of these characters, however, must only be looked upon as *generally* true of this or that group and subject to particular exceptions—convenient as guides to classification, but to be used with great caution.

Araignées sont assez différentes de celles des *Avicularia*; tandis que ceux-ci sont assez lents, les *Tapinauchenius* courent avec une excessive rapidité."—"Je les ai trouvés sous des écorces d'arbres abattus dans les défrichements."

This is very interesting, for the habit is evidently totally different from those of the genus *Santaremia* described below, and gives an additional warranty to the goodness of the generic distinction.

In certain Spiders from the Amazons and Trinidad, which resemble *Tapinauchenius* in the straightness of the anterior row of eyes, the first pair of legs is longer than the fourth, the sternal sigilla iii. and iv. are more removed from the margin, the legs of the iii. and iv. pairs are more slender than those of the first two pairs, and the legs are not clothed with long fringing hairs. On the ground of these differences I have formed a new genus for their reception, including two species, *Santaremia pococki* and *S. longipes*; *Tapinauchenius* will include *T. sancti-vincenti*; while *Avicularia* will include *A. avicularia*, *A. walckenaeria*, *A. rutilans*, &c.

The following characters may be found useful in distinguishing these three genera:—

A. Anterior row of eyes strongly procurved	*Avicularia*, Lam.
B. Anterior row of eyes straight or nearly so.	
1. First pair of legs equal to the fourth. Legs clothed with long hairs	*Tapinauchenius*, Auss.
2. First pair of legs longer than the fourth. Legs clothed with short hairs	*Santaremia*, n. g.

SANTAREMIA, gen. nov.

Anterior row of eyes straight or nearly so. Legs of first pair longer than those of fourth. Four pairs of sternal sigilla visible: 1st at base of labial plate; 2nd marginal; 3rd submarginal; 4th remote from margin. Posterior pair of spinners not longer than width of sternum. Carapace gibbous (in profile) behind the eyes. Patella and tibia iv. *shorter than carapace. Patella and tibia* i. *equal to or longer than carapace. Legs clothed with short hairs. Protarsus and tarsi* iii. *and* iv. *much narrower, less spatuliform than* i. *and* iii. *Habits terrestrial, forming silk-lined burrows in the ground.*

Type. SANTAREMIA POCOCKI[1], n. sp., ♀.—*Hab.* Santarem. Type specimen in coll. Brit. Mus. Nat. Hist. 1896. (Plate XXXIII. figs. 8, 9, & 13; Plate XXXIV. fig. 20; and Plate XXXV. fig. 12.)

Colour. Carapace dark brown, clothed with short sandy yellow-grey hairs, rufous towards and on posterior margin. Base of mandibles clothed with sandy and much darker brown hairs. Abdomen rich chocolate-brown, with scattered rufous hairs, more numerous towards spinners. Ventral area brown. *Sternum*, coxæ

[1] I have great pleasure in connecting this species with the name of my friend Mr. R. I. Pocock of the Nat. Hist. Museum. He had already named it in MS. from specimens taken near Pará by Mr. Bates, but kindly withdrew his claim to the species in my favour.

of legs, and pedipalps rich brown. Underside of legs clothed with sandy yellow-brown hairs. Inner margin of coxa of pedipalp and outer margin of fang-groove fringed with fiery-red hairs. *Protarsi* and tarsi i. and ii. entirely, $\frac{2}{3}$ of protarsus iii. and whole of tarsus, $\frac{1}{3}$ of protarsus iv. and whole of tarsus, furnished with a dense pad of scopular hairs. *Tarsi* i., ii., iii., and iv. broad, spatuliform, but iv. much less so. Upperside of legs clothed with rich chocolate-brown hairs on femora, becoming more rufous along the four distal segments. Hair on legs short (not long, as in *Avicularia*). *Patellæ* of legs i. and ii. and pedipalp slashed with four narrow lines of short, pale, sandy-grey pubescence, central pair confluent towards apex of segment. *Tibiæ* i. and ii. of pedipalp with two widely separate pairs of pale lines of pubescence; each pair very narrowly separate. *Protarsi* i. and ii. and of pedipalp with fine, short, central, pale basal line. Legs iii. and iv. exhibiting a somewhat similar but less conspicuous arrangement of pale lines. *Femora* of all four pairs with two faint dorsal and a pair of lateral yellow lines on the outer side, the latter obsolete on iv.

Carapace longer than broad, narrow, in proportion of 20 : 16, distinctly gibbous behind eye-tumulus. Central fovea deep, transverse, slightly procurved. *Eye-tumulus* twice as long as broad. Anterior row of eyes only a little procurved. *Fang-groove* armed with a single row of short conical teeth along outer margin, its floor towards base studded with minute granules. *Sternum* with four pairs of *sigilla* visible: 1st at base of labial plate, 2nd marginal, 3rd submarginal, 4th remote from margin.

Labium quadrate, a little longer than broad; distal third entirely studded with minute cuspules. Coxa of pedipalp almost twice as long as broad; inner distal angle slightly produced, obtusely conical; inner basal angle studded with minute cuspules; inner basal disc with a few more scattered cuspules. *Legs* of fourth pair shorter than those of first pair. Patella and tibia i. equal to length of carapace. Tibia and patella iv. shorter than carapace. Tarsus of pedipalp with *one*, of legs i., ii., iii., and iv. with *two* small stout hooked claws, their inner central edge armed with five minute denticles. *Spinning-mamillæ* four; posterior pair trisegmental, second segment shortest; the whole three segments taken together not longer than width of sternum.

The habits of *Santaremia pococki* are well known and have been for years. So long ago as 1879, Mr. Bates mentions the large spiders found near Pará, forming long silk-lined tubes in the sandy soil near Nazareth.

I was unable to secure any specimens from Pará myself, but met with abundance at Santarem and at several other places on the river, Monte Alegre.

At Santarem, their burrows, eighteen inches long, were most numerous along the banks of the waggon-track running across the sandy campos to the forest. Here at any time of day, though more especially at night, the females might be seen sitting at the entrance of the tube, which was trumpet-shaped and usually over-

hung by a tuft or two of hairy campos-grass or arched over behind with a few dry leaves, the first two pairs of legs, pedipalps, and mandibles alone visible; in colour closely similar to the surrounding sand. A footfall, or a shadow, and they would vanish. What their food may be I cannot say, for no débris was ever to be found in the burrow. Do they wait for it to come within reach, or do they go and seek it? I think the former. On several occasions, having sat up all night and now and again, at intervals of an hour, been the round of the burrows, each tenant was always found in exactly the same position; nor did I ever find one running about at night over the campos or in the forest. They may possibly, however, dash out a few feet and seize their prey when it passes, but I do not think they actually go in search of it.

What the males do with themselves I am utterly unable to say, for though I watched and searched and waited many times at night and dug out numerous burrows, yet on no occasion did I find a male within, nor find one, as I fully expected to do, running over the sand outside.

Females were taken in all stages of development, though it is quite possible I was too late for the male sex.

In spinning the trumpet-shaped mouth to the burrow, the Spider takes up a position with the abdomen and hind legs only appearing from the burrows, and then by rubbing the spinners backwards and forwards covers the ground round the entrance with fine white silk. The large white cocoon, formed of a loose bag of silk, containing from 80–100 eggs, lies loose in the slightly enlarged end of the burrow. When the young are first hatched, they nourish themselves on the moist envelopes of the eggs, whence they have just emerged. Later they may be found crowding the entrance of the den or below with their mother.

Contrary to one's expectation, the temperament of these spiders appears to be gentle; though raising themselves on the hind legs and striking with the mandibles when irritated, yet there is no inclination to initiate an attack. Neither in confinement, though starving for want of food, since they would eat neither worms, caterpillars, crickets, cockroaches, moths, nor millipedes, did they show any inclination to attack each other nor the young spiders which were with them. Water they drank eagerly enough.

Nothing could be externally more unlike than the Spiders I have included in this genus and those usually included in the genera *Avicularia* and *Tapinauchenius*. The latter are much more hairy and the first pair of legs are equal to or less than the fourth pair. In the former the legs are not clothed with long hairs, and the first pair are longer than the fourth. The coxæ, femora, and patellæ, too, of the first two pairs of legs are very stout, while those of the third and fourth pairs are more slender, especially the fourth. In *Avicularia* and *Tapinauchenius* the tarsi and protarsi of all four pairs are broad and spatuliform; in *Santaremia* those of the third pair are much less so than those of the first

two pairs, while those of the fourth pair are even less so than the third. I should expect to find, too, that no species with characters agreeing with those of *Santaremia* would be found with an arboreal mode of life. The habit of burrowing in the earth has undoubtedly been a factor in the differentiation of various genera and of this genus also, though one must not speak too confidently in the absence of data. The feathery legs and broad spatuliform terminal joints on all four pairs of legs in *Avicularia* and *Tapinauchenius* are obviously the outcome of an arboreal habit [1].

Genus Harpalothele, Lenz.

Under the generic name *Harpalothele*, M. Simon, in Hist. Nat. Ar. 1892, pp. 180, 181, distinguishes three groups corresponding to three different geographical areas. The first are those from Oceania, which will fall under the genus *Ixamadus*, Sim., with *I. varia*, L. K., as the type. The second are the African species, which fall under the genus *Harpalothele*, Lenz., with *H. reuteri*, Lenz, as the type. The third are the more numerous species from the Neotropical regions, which fall under the genus *Fufius*, Sim., with *F. atramentarius* as the type.

The last generic name I have retained in this paper for convenience' sake, and have added a brief reference to the other species of the group which have been already described from South America.

Genus Harpalothele, Lenz.

Type. *H. reuteri*, Lenz, Zool. Jahrbücher, i. p. 397 (1886). *Hab.* Madagascar.

Genus Ixalus, L. Koch.

Type. *I. varius*, L. K. (♂ ♀; ♂ 14 mm., ♀ 15 mm.), Ar. Austral. 1873, p. 469. *Hab.* Oceania.

The name *Ixalus*, however, being preoccupied, Simon has renamed the genus *Ixamadus*.

Genus Ixamadus, E. Sim.[2]

Type. *I. varius* (L. K.), E. Sim. Bull. Soc. Zool. Fr. 1887, note, ♂ ♀. *Hab.* Port Bowen, Australia.

[1] *S. longipes*, n. sp., ♀. *Hab.* Trinidad. Type specimen in coll. Brit. Mus. Nat. Hist. 1896.

Colour. Carapace mahogany-brown, clothed with sandy-yellow hairs. Mandibles clothed with short sandy yellow hairs (no long ones as in *pococki*). Abdomen clothed with sandy yellow-grey hairs. Coxæ of i., ii., iii., and iv., femora of i. and ii. deep chocolate-brown underneath; the latter clothed above and on sides with sandy-yellow hairs. Underside of tibiæ i. and ii. clothed with sandy-yellow hairs, glossy. Patellæ and tibiæ of legs without longitudinal stripes. Patella and tibia i. longer than carapace (25 mm.—21 mm.). Habits unknown. Carapace 21×18 mm.

[2] In Hist. Nat. Ar. 1892, p. 180, the name has been misprinted *Ixamatus*.

Genus Fufius, E. Simon, 1888.

Type. *F. atramentarius*, E. Sim. (♀), Ann. Soc. Ent. Fr. 1888, p. 213. 17 mm. long. *Hab.* Guatemala.

Fufius auricomis, E. Sim. (Plate XXXV. figs. 4, 6, 8, 16.)

♂ ♀. *Hab.* Santarem, Lower Amazons. ♂ 12·5 mm. long.; ♀ 17 mm. long. In coll. Brit. Mus. Nat. Hist. ♂ new.

♂.—*Colour.* Carapace and basal joint of mandibles black, clothed with fine golden hair. Sternum, coxæ of pedipalp and of first pair of legs deep pitch-brown. Femora black, apex tinged with pink; patella pitch-brown; tibiæ of legs black, of pedipalp pitch-brown; protarsi and tarsi slightly paler; 2nd, 3rd, and 4th pair of legs pitch-brown, paler towards extremity. Tibiæ and protarsi each with two dark annulations, one at the apex, the other at or towards the base. Coxæ and trochanter of pedipalpi and all four pairs of legs clothed above with golden hairs. *Abdomen* pitch-brown, with a central, dorsal band of fine golden hairs, more scattered laterally towards apex. Ventral area brown; spinners paler, second and third joints suffused with dark brown.

Carapace longer than broad, finely granulate; cephalic area occupying over half the length of carapace; central fovea deep, recurved. Cephalic and thoracic impressions well marked.

Ocular tumulus low, height double its breadth. Central anterior eyes large, circular, half a diameter from margin of clypeus, half a diameter apart, almost in contact with anterior laterals; less than a quarter diameter from posterior centrals. Anterior laterals reniform elliptic; their axis rather less than diameter of anterior centrals. Posterior laterals ellipsoid, their axis equal to half the axis of anterior laterals and one quarter their axis from them. Posterior centrals very small, their axis equal to one third the diameter of the anterior centrals, ellipsoidal, less than half an axis from lateral posteriors, almost two diameters of anterior centrals apart.

Sternum longer than broad, finely granulate and sparsely tuberculate, with a longitudinal smooth central channel; its width one third less than its length; posterior margin fringed with stiff separate dark hairs. Sigilla well marked, especially 1st, 2nd, 3rd, and 4th pairs; 2nd and 3rd marginal.

Mandibles without rastellum. Inner margin of fang-groove armed with a single row of eight conical teeth, its floor studded towards the base with minute cusps; outer margin fringed with rufous hairs, inner with a few fine hairs.

Labium longer than broad, attenuate towards apex, with two or three minute cusps. Coxa of pedipalp twice as long as broad, finely granulate and sparsely tuberculate, studded with numerous minute cusps at base, clustered towards inner angle. Inner apical angle slightly produced and studded with minute cusps. Inner margin thickly fringed with rufous hairs. Tibia of pedipalp incrassate, fringed with long hairs; tarsus short, dilate,

clothed with hairs. Bulb short, pyriform; stylum slender, sinuous. The whole length of bulb and stylum one-eighth less than that of tibia.

Legs i., iv., ii., iii. Coxæ, trochanter, and femur finely granulate; the latter without spines below, two or three above. Patella i. with six or eight spines beneath; tibia i. with two series of 5—5 beneath, and two or three spines on either side; bearing at its apex beneath a stout, sharp, conical spur, directed forwards and outwards, *not bifid*. Protarsus furnished with two spines beneath and a pair at the apex; strongly curved at base, the apical angle of curved portion bearing a short, very stout, conical spur. Tarsi i., ii., iii., iv., furnished on underside with scopuliform hairs; protarsi i. and ii. slightly so on either side at apex; iii. and iv. not scopulate. Tibiæ and protarsi ii., iii., and iv. spinose beneath; tibia iii. with one or two spines also on the upperside.

Tarsal claws i., ii., iii., iv. three-clawed; superiors with a double row of 6–8 denticles.

Spinners four; posteriors three-jointed, one fourth the length of abdomen. Basal joint longer than the middle, equal in length to the terminal. Anterior spinners half the length of the basal joint, twice their diameter apart at base.

Comparative measurements in millimetres.—♂. Carap. 6·5 long., 5·5 lat. Abd. 6 long., 3·5 lat. Cephl. area 4 long. Sternum 3·5 long., 2·5 lat. Coxa of pedipalp 2·5 long., 1·25 lat. Pedes, long. i. 23—ii. 20—iii. 17—iv. 22. Artl. i. long. 3—1—5—3 4—4·25—2·5. Artl. iv. long. 2—1—5·5—2—4·5—4·5—2. Postr. mam. 3·5 long. Artl. 1·25—1—1—1·25. Antr. mam. ·75 long., 1 apart at base. Mandib. 3 long. Large male 13 long.; small male 10 long.

♀.—*Colour*. Carapace and base of mandibles dark pitch-brown; the former clothed with converging lines of golden hairs; base of latter with a dorsal band, and two narrow, external, lateral bands of fine golden hairs, and a few interspersed amongst the intervening black hairs. *Abdomen* clothed with a dense coat of deep chocolate-brown hairs, having also a dorsal clothing of golden hairs, extending to and spreading laterally towards the spinners, Ventral surface rich chocolate-brown.

Carapace longer than broad; central fovea deep, recurved; cephalic area rather more than half the length of carapace. *Abdomen* longer than carapace. *Spinners*: posterior pair a little over one third as long as abdomen; basal joint longest; apical half as long again as middle joint. Anterior pair half the length of basal joint of posterior pair, twice their diameter apart.

Ocular tumulus twice as long as broad. Central eyes largest, proportionally the same as in the male, but further apart. Anterior centrals nearly half a diameter from posterior centrals; same distance from anterior laterals. Posterior centrals and laterals almost in contact; the latter nearly their axis distant from anterior laterals. Anterior centrals circular, the rest ellipsoidal.

Mandibles scarcely as long as cephalic area. Fang-groove with

a row of eight stout conical teeth on inner margin. Floor of groove studded towards base with minute cusps.

Sternum longer than broad, finely granulate and sparsely tuberculate, with a longitudinal, central, smooth channel. Posterior margin fringed with stiff, separate, black hairs. Sigilla i., ii., iii., iv. well marked; iii. and iv. submarginal. Labial impressions very deep.

Labium longer than broad, narrower towards apex, armed with five or six cusps; its base much depressed.

Coxa of pedipalp longer than broad, slightly produced and obtusely rounded at inner apical angle, the latter being studded with minute cusps. Pedipalp dark pitch-brown.

Legs dark pitch-brown; i. and ii. the darkest. Femora blotched beneath and also slightly above with black; patella suffused with black at apex; tibiæ and protarsi with a dark annulus at apex and towards or at base. Upperside and apex of coxa, femur, tibia, and, slightly so, the tarsus enriched with scattered golden hairs. Tarsus of pedipalp, tarsus and two-thirds of protarsi i. and ii. densely scopulate; of iii. and iv. not scopulate. Femora of pedipalp and legs without spines. Tibiæ i. and ii. with 3—3 setiform hairs beneath; iii. and iv. with 3—3 spines and a single spine. Protarsus iii., alone, with spines above. Protarsus of pedipalp armed beneath with numerous spines; protarsi of leg i. with 5 spines; of ii. with two series of 3—3 spines, besides isolated ones; of iii. and iv. with numerous spines. Tarsi of pedipalp with two spines, of legs without any spines. Tarsus i. with 3 claws; superiors armed with a double series of 6—6 denticles beneath. Tarsus ii. with 3 claws; superiors with a double series of 6—6 denticles. Tarsus iii. with 3 claws; superiors with a single row of 3 denticles. Tarsus iv. with 3 claws; superiors with single row of 6 denticles.

Spinners four; posterior pair shorter than abdomen, appearing four-jointed from above, on account of pseudo-joint; basal joint longest, central shortest, terminal longer than the latter. Anterior pair half the length of basal joint of posterior pair; twice their diameter apart.

Comparative measurements in millimetres.—♀. Carap. 8 long., 6 lat. Abd. 9 long., 6 lat. Cephl. area 5 long. Stern. 4·25 long., 3·5 lat. Coxa of pedipalp 3 long., 2 lat. Pedes, long. i. 23—ii. 21—iii. 19—iv. 23. Artl. i. long. 4—1·5—5—3—3·5—3·5—2. Artl. iv. long. 2·5—1·25—5—2·5—4·25—4—2. Postr. mam. 5 long. Artl. 1·75—1—1·5. Antr. mam. 1 apart. Mandib. 4 long.

Immature ♀.—Similar in character and coloration to the adult, but pale yellow-brown on carapace, sternum, and mandibles. Legs orange, ornamented with black annuli and blotches. Femora with a submedian and an apical interrupted annulus. Base and apex of patella, tibia and protarsus of all four pairs ornamented with entire, or interrupted, annuli. Central blotch

on femur iv. almost obsolete. Pedipalp variegated similarly to the legs.

Two males and three females of this handsome Spider were taken on the Lower Amazons, at Gurupá and in the forest of Santarem. They are found under loose pieces of bark; but whether they construct any kind of nest I am unable to say. The immature specimens are much more brightly coloured than the adult. The male of this species was hitherto unknown. A female too was taken by Mr. Piffard near Manãos.

There are four species from the New World, described under the names *Harpalothele* and *Fufius*, which would fall under the latter name should the distinction made in this paper be a permanent one.

Fufius atramentarius Sim. (♀, 17 mm. long), Ann. Soc. Ent. Fr. 1888, p. 213. Certainly not identical with the above, as shown by the following extract:—"Cephalothorax nigerrimus, opacus, fere glaber." "Medii postici anticis plus quadruplo minores." "Mamillæ ferrugineæ." "Pedesque nigri, sed patellis dilutioribus et rufescentibus." *Hab.* Guatemala.

Harpalothele lanicia Sim. (♀, 22 mm. long), Ann. Soc. Ent. Fr. 1892, p. 283. "Mamillæ atræ." "Sternum, coxæ, et partes oris nigræ." "Pedes fusco-rufescentes, flavido-pubescentes, et nigro-hirsuti." *Hab.* Bolivia; Espiritu Santo.

The legs are not annulate as in *H. auricomis*.

Harpalothele garleppi, Sim. (♀, 25 mm. long), Ann. Soc. Ent. Fr. 1892, p. 284. "Mamillæ fuscæ." "Pars labialis mutica, paulo latior quam longior." No mention is made of the very characteristic colouring of the legs evident in *H. auricomis*. *Hab.* Bolivia.

Harpalothele albovittata, Sim.(♂), Ann. Soc. Ent. Fr. 1891, p. 306.

8 mm. long. *Hab.* Manãos, Lower Amazons.

"Cephalothorax niger, opacus, pilis longis pallide fulvo-nitidis parce vestitus. Abdomen nigrum, linea media integra albo-argenteo-pilosa decoratum. Chelæ nigræ supra ad basin vitta albo-pilosa ornatæ. Pars labialis mutica."

"Tibia 1^1 paris incrassata, ovata, inferne biseriatim aculeata (aculeis 3—3, interioribus longioribus) et extus ad apicem calcare vallido, apice inæqualiter bifido, armata. Metatarso gracili, ad basin curvato, et inferne, in parte basali, tuberculis binis geminatis insigniter instructo. Bulbo simplici, longe attenuato, aculeo gracillimo brevi et curvato ad apicem munito. Mamillæ nigræ, articulo apicali testaceo."

Harpalothele auricomis, Sim. (♀) Ann. Soc. Ent. Fr. 1891, p. 305.

Hab. Pará, Brazil.

"Cephalothorax obscure fuscus, pilis longis, nitidis, subaureis vestitus." "Pedes breves, pallide fulvi, nigro-maculati et annu-

lati." "Tibiæ quatuor anticæ inferne aculeis setiformibus 3—3, metatarsi aculeis validioribus 3—3 instructi, pedes postici numerose aculeati." "Mamillæ fusco annulatæ." "Long. ceph.+abd. 13·5 mm."

There is very little doubt, short of actual comparison of types, as to the identity of *H. auricomis*, Sim., with my female adult specimen from Santarem and with the immature females from Gurupá. The males have not hitherto been described, but the two obtained on the Lower Amazons undoubtedly belong to the females taken at the same time.

Genus Diplura, C. Koch; E. Sim.

Type. *Mygale macrura*, C. K. (♂, 6·5 mm. long), Die Arachniden, ix. p. 38, tab. ccc. fig. 715 (1842). *Hab.* San Juan, West Indies. In coll. Impr. Mus. Berlin.

The genus *Diplura* was founded in 1850, 'Uebersicht des Arachn.,' C. L. Koch, p. 75. The author says of the type, *D. macrura*, "*Sehr gerade ausstehende Spinnwarzen*," and in his description of the same spider under *Mygale* he says "Kopf und Thorax rostgelb"—"Der Hinterleib sammt den Spinnwarzen braunschwarz."

The figure on plate ccc. seems to suggest that this species is closely allied to that described below as *D. sanguinea*, but the unicolorous abdomen would prove it to be certainly a different species. Not having seen the type of the genus, which apparently is still extant in Berlin, and feeling pretty sure that it will prove not congeneric with the three species described below, I have considered it less liable to lead to confusion in the future to form two new genera for their reception. Two of them, *Melodeus sanguineus* and *M. niger*, might possibly fall under Simon's group A, while the third, *Harmonicon rufescens*, would fall under group B (*cf.* Hist. Nat. Ar. i. p. 178, 1892). If, however, group A really corresponds, as M. Simon suggests, to Bertkau's genus *Thalerothele*, then mine will not fall into the group, for of *Th. fasciata*, Bert., the type of the genus, Bertkau says "scopula nulla"; whereas all these three species possess very distinct scopulæ on the tarsi of all four pairs of legs. It is just possible, however, that Bertkau's type may be immature, in that case the scopula would probably not be developed; but of this I cannot speak with certainty.

Trechona[1] is undoubtedly a good genus, the tarsi and protarsi

[1] Genus Trechona, C. Koch.

Type. *Trechona zebrata* (Walck.), 1835, sub *Mygale* (♀). In coll. Brit. Mus. Nat. Hist. 1896.

Anterior eyes almost equal, forming a slightly curved line, almost straight. Carapace a little raised behind the eye-tumulus. Posterior spinners one-half shorter than abdomen; segments subequal. Legs long, robust; protarsi and tarsi i. and ii. entirely and densely scopulate, the former with three or four long spines lying amongst the scopulæ; the latter without any central series of long setæ amidst the scopulæ. Protarsus iii. with distal two-thirds, tarsus iii. entirely, densely scopulate. Protarsus iv. with distal half and entire tarsus iv.

of the type female being furnished with a dense scopula. The lyra also differs considerably in character from those of the three species here described.

Besides these forms of *Diplurina*, of which the females (and doubtless the males as well) possess the lyra and pecten, there are before me others which, being otherwise closely allied, possess no lyra or pecten.

A male adult and a female, apparently immature, from Peru, present characters which, in conjunction with the absence of stridulating-organs would seem to warrant the formation of another genus for their reception. Whether these will eventually prove to be congeneric with *Diplura macrura* (C. K.) I cannot say, but should not be surprised if such were the case.

For the present I form a genus *Neodiplura*[1] for the reception of those which possess no stridulating-organs. Of *D. cousini*, ♀, Sim., of which the labium is spinulose; *D. æquatorialis*, Auss., ♀, closely allied to *D. cousini* (sec. Simon); *D. longicauda*, Auss., ♀, with spinners longer than the abdomen; and *D. rogenhoferi*, Auss., ♀, I cannot speak with any certainty. The characters given would apply fairly well, from a generic point of view, to any of the Dipluriform spiders.

Harmonicon, gen. nov.

Posterior spinning-mamillæ as long as abdomen; terminal segment the longest. Legs longer, more slender. Fang-groove with a single

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more lightly scopulate. First pair of legs a little longer than fourth. Tarsal claws 3. Superiors armed with a double series of denticles. Fang-groove armed on the outer side with a single row of teeth; floor of groove towards base studded with cuspules. Coxa of pedipalp furnished on inner side with 17 long claviform spines and a thick pad of numberless smaller spines, interspersed with claviforms. Base of mandible furnished with seven or eight stout spiniform hairs, incrassate at base, the first five isolated. These form the lyra and pecten of the stridulating-organs.

[1] Neodiplura, gen. nov.

No lyra or pecten on coxa of pedipalp and base of mandibles respectively. Tarsi and protarsi i. and ii. fairly densely and entirely scopulate; the former with no central series of setæ; the latter with spines amidst the scopulæ. Tarsi iii. and iv. densely and entirely, protarsi iii. and iv. slightly and towards apex, scopulate. Tarsal claws 3; superiors armed with a double series of denticles.

Neodiplura jelskii, n. sp. (♂ ♀). *Hab.* Peru. Type e coll. W. Kulczynski, Cracow. (Plate XXXV. figs. 5, 10, 11, 14.)

Colour. Carapace mahogany-brown, clothed with short silky yellow pubescence; abdomen brown, clothed with long silky yellow hairs, with a double dorsal series of 5 or 6 short, transverse, dull orange bars. Sternum and legs brown, with short silky yellow hairs.

Carapace a little longer than broad, flat, slightly raised behind eye-tumulus, with a shallow depression on either side and a recurved groove behind eyes. Central fovea small and recurved. Eye-tumulus prominent, diameter of anterior centrals larger than the axis of laterals; less than one diameter apart; less than half from laterals. Anterior row almost straight, slightly procurved. Posterior centrals smaller than posterior laterals, and almost in contact with

row of teeth on the outer margin and a row of fine capsules in centre of fang-groove. Tarsi i. *and* ii. *distinctly scopulate, with central series of long setæ. Coxa of pedipalp furnished with a lyra formed of* 5 *long, curved, claviform spines. Base of mandible with* 4 *isolated, incrassate bristles at the base. Diameter of anterior central eyes distinctly less than axis of laterals.*

HARMONICON RUFESCENS, n. sp. (Plate XXXIII. figs. 3 & 6, and Plate XXXV. figs. 2 & 3.)

♀. 27 mm. long. Type in coll. Brit. Mus. Nat. Hist. *Hab.* Santarem, Lower Amazons.

♀.—*Colour.* Carapace dull orange, almost destitute of hairs and pubescence. Abdomen rufous, clothed with fine black hairs, more numerous in front; spinners rufous. Sternum and legs dull yellowish with brown shading, clothed with spines and short black hairs. Mandibles dull orange, clothed with black hairs.

Carapace longer than broad. Cephalic area two-thirds the length of carapace. Central fovea only slightly recurved. Thoracic striæ well-marked. *Ocular tumulus* slightly raised above the level of the carapace, three times as long transversely as wide. Anterior centrals circular, three-fourths of a diameter apart, less

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them. *Sternum* longer than broad. Sigilla well-marked: 1st pair very large at base of labial plate; 2nd submarginal; 3rd remote; 4th more remote; each opposite the coxa of one pair of legs. Labium broader than long, semicircular; apex not spinulose. Coxa of pedipalp twice its breadth, anterior distal angle not produced, anterior basal angle studded with numerous cuspules. Legs long, 4, 1, 2, 3. Tibiæ and protarsi i. and ii. spinose beneath; iii. and iv. above and below. Tibia i. with a stout spur-like spine on outer side at apex; protarsus i. with a stout tubercle on outer side towards the base. Tarsi slender, flexuose, much curved; protarsus i. thickly recurved. Tarsal claws 3; superiors armed with a double series of denticles. Posterior spinners shorter than abdomen, trisegmental, segments subequal. Anterior spinners within two diameters of each other. *Pedipalp*: tibia with long spines beneath, tarsus very short, bulb short piriform, its apex prolonged into a short, stout, simple, slightly curving spine, directed outwards and backwards. *Fang-groove* with a single row of teeth on the outer margin.

♂.—Carapace 11 mm. long., 9·5 broad. Abdomen 12·5 mm. long. Mandibles 5 mm. long. Post. spinners 9 mm. long. Legs, i. 55 mm.; ii. 50 mm.; iii. 45 mm.; iv. 53 mm.

♀ (immature).—Colours and general characters the same as of the ♂. Diameter of anterior central eyes less than axis of laterals, thus differing from the male, the difference being possibly due to immaturity.

These specimens were kindly submitted to me by my friend Prof. Kulczynski, of Cracow. They were taken by Dr. Constantine Jelski in Peru.

A. Coxa of pedipalp and base of mandible with stridulating-organs.	
1. Tarsal scopula without central series of long setæ ...	*Trechona*, O. K.
2. Tarsal scopula with central series of long setæ.	
a. Legs long, slender. Terminal segment of posterior pair of spinners longer than either of the basals.	*Harmonicon*, n. g.
b. Legs short, stout. All three segments of posterior pair of spinners subequal	*Melodeus*, n. g.
B. Coxa of pedipalp and base of mandible without stridulating-organs	*Neodiplura*, n. g.

than half a diameter from anterior laterals. Anterior laterals ellipsoidal, their axes one-half longer than diameter of anterior centrals. Posterior centrals smallest, oval, less than their transverse diameter from anterior centrals, only one-half the transverse diameter from posterior laterals. Posterior laterals ellipsoidal, their axes almost equal to diameter of anterior centrals; less than half their transverse diameter from anterior laterals. Anterior row procurved.

Mandibles parallel-sided; fang-groove armed on inner side with a series of 12 stout conical teeth; floor studded with a single distinct row of 12 small cusps, diminishing in size towards the base, where are also numerous irregular small cusps. Outer margin fringed with thickly-set rufous hairs, four at the base being stouter and separate.

Sternum a little longer than broad, smooth, set with black separate hairs; sigilla distinct, submarginal. *Labium* broader than long, convex, smooth, not studded with cusps; set with long black bristles. *Coxa of pedipalp* twice as long as broad, its basal anterior angle studded with a central longitudinal area of small black cusps. Anterior apical angle very slightly produced, smooth. Tarsus not scopulate; tarsal claw furnished with 6 denticles on the basal half beneath. Coxa of pedipalp furnished on the inner side, on the basal portion of the central ridge, with the "lyra," consisting of 5 stout curved spines; three curving hairs towards the anterior portion, and one small bristle towards the posterior portion of the ridge. These 5 spines strike on the four stout, separate, isolated bristles above mentioned as situated on the mandible, which together form the "pecten." These two structures, the "lyra" and the "pecten," together constitute the stridulating-organ.

Legs long and slender. Femora i. and ii. without spines; iii. with a few spiniform bristles; fourth pair of legs absent. Patella i., ii., & iii. without spines. Tibiæ i. & ii. with one or two spines beneath; iii. with a double row of 3—3 on either side. Protarsi i. and ii. with 5 and 6 spines respectively beneath; iii. with numerous spines. (N.B. The number of spines on the legs is not constant.) *Tarsi* with three claws, superior pair armed beneath with a double series of 5—6 denticles. Inferior claw long. Tarsi i. and ii. scopulate.

Abdomen long-narrow. Spinners four. Posterior pair as long as abdomen, three-jointed; basal equal in length to the second joint; terminal joint longer than the second. Anterior pair half as long as the basal joint of posterior pair, nearly the full length of one of them apart.

Comparative measurements in millimetres.— ♀. Carap. 10 long., 8 lat. Abd. 17 long., 9 lat. Cephl. area 6·5 long. Stern. 5 long., 4 lat. Coxa of pedipalp 3·5 long., 2 lat. Pedes, long. i. 42—ii. 38—iii. 38—iv. abest. Artl. i., long. 4·8—2—9·5—3·75—8—7·75—5. Artl. iv. long.: abest. Postr. mam. 17 long. Artl. 5—5—7 long. Antr. mam. 2·8 long., 2 sept. Mandib. 5 long.

A single example of this fine Theraphosid, of the female sex, was taken in a huge web of the "Agelenoid" type in the damp low-lying portion of the forest near Santarem. Many more of the webs were seen, but the tube is spun so far down amongst the roots of the trees that it is next to impossible to secure specimens, for they retire with lightning speed on the smallest sign of danger.

MELODEUS, gen. nov.

Posterior spinning-mamillæ as long as or shorter than abdomen; segments equal in length. Legs shorter, stout, especially the femora. Fang-groove with a single row of teeth on outer margin and numerous cuspules towards base. Tarsi i. *and* ii. *distinctly scopulate*[1], *with central series of long setæ. Coxa of pedipalp furnished with from* 7–10 *curved claviform spines. Base of mandible with* 3 *or* 4 *isolated bristles incrassate at the base. Diameter of anterior central eyes equal to or scarcely less than axis of anterior laterals.*

MELODEUS SANGUINEUS, n. sp. (Plate XXXIII. figs. 1, 4, 7, and Plate XXXV. fig. 1.)

♀. 24 mm. long. Type in coll. Brit. Mus. Nat. Hist. *Hab.* Santarem, Lower Amazons.

♀.—*Colour.* Carapace bright orange-red, clothed with short, silky, rufous hairs. Abdomen black, clothed with dense pubescence, furnished with erect black hairs, having on either side two separate longitudinal bands of fine transverse obliquely dull orange blotches, interrupted towards the ventral surface. Ventral area clothed with mouse-grey pubescence. Legs short, stout, yellow-brown, darker towards their extremities, clothed with fine black hairs and rufous pubescence. Sternum and mandibles deep brown, the latter darker at apex, both clothed with black hairs.

Carapace a little longer than broad; cephalic area not quite three-quarters the length of carapace. Central fovea deep, recurved; thoracic striæ well marked. *Ocular tumulus* slightly raised above the level of the carapace; three times as long as its width. Anterior centrals large, circular, half a radius apart, rather less from the anterior laterals. Anterior laterals ellipsoidal, their axis equal to the diameter of anterior centrals. Posterior centrals smallest, oval, half their diameter from anterior centrals, almost in contact with posterior laterals. Posterior laterals ellipsoidal, their axis less than that of anterior laterals, almost in contact with the latter; anterior row almost straight. (N.B. The eyes vary in different specimens.)

Mandibles parallel-sided, slightly enlarged towards apex. Fang-groove armed on inner side with 11 stout conical teeth; its floor studded towards the base with numerous minute cusps. Outer margin fringed with rufous hairs, of which 8 towards the base are isolated, separate and thickened towards their base.

Sternum longer than broad, set with black hairs, each springing

[1] In immature examples the scopula is entirely absent.

from a small tubercle, and with rufous pubescence. Sigilla present, submarginal. *Labium* broader than long, clothed with hairs, not cuspidate. *Coxa of pedipalp* twice as long as broad; anterior basal angle studded with a central band of minute cusps; anterior apical angle slightly produced, not cuspidate: on its inner side, about the middle, towards the inner basal angle, is situated a series of 10 stout clavate spines, whose free ends play across the stout separate hairs on the base of the mandible; these together constitute the "lyra" and "pecten" of the stridulating-organ.

Legs short and stout. Femora not spinose; patellæ i., ii., and iv. not spinose, iii. with one or two spines. Tibiæ i. and ii. with three spines on inner side towards apex, which is scopulate; iii. and iv. with a few spines on either side. Protarsi i. and ii. armed beneath with 5 and 6 or 7 spines respectively; of iii. and iv. also spinose. Tarsi i. and ii. short, slightly curved, transversely striate above, clothed with a scopula; iii. and iv. not scopulate. *Tarsal claws* 3; superior pair armed beneath with a double series of 6–7 denticles. Tarsal claw of pedipalp with a single row of 5–6 denticles.

Abdomen shorter and broader than in *M. rufescens*. Mamillæ four: posterior pair shorter than abdomen; basal joint the longest, second and third equal: anterior pair a little over half the length of the basal joint of the posterior pair, almost as wide apart as their length.

Comparative measurements in millimetres.—♀. Carap. 11 long., 10 lat. Abd. 13 long., 9 lat. Cephl. area 7 long. Stern. 6 long., 4 lat. Coxa of pedipalp 4·5 long., 2·5 lat. Pedes, long. i. 35—ii. 33—iii. 31—iv. 38. Artl. i. long. 5—2·5—8—5—6—6—3·5. Artl. iv. long. 4·5—2·5—8·5—4—7—8·5—4. Postr. mam. 11 long. Artl. 4—3·5—3·5. Mandib. 5·5 long. Antr. mam. 2·5 long., 2 sept.

Numerous specimens of the female sex of this handsome species were taken at night as they sat in the entrance of the tube of their large "Agelenoid" webs in the forest near Santarem. Many were also taken under logs of wood, where the web and tube assume the character of those of the genus *Cœlotes* in Europe.

MELODEUS NIGER, n. sp. (Plate XXXIII. figs. 2, 5.)

♀. 20 mm. long. Type in coll. Brit. Mus. Nat. Hist. *Hab.* Santarem, Lower Amazons.

♀.—*Colour.* Carapace sepia-brown, clothed with silky rufous pubescence. Abdomen deep brown, clothed with grey hairs; having on the dorsal area a double series of 5 obliquely transverse rufous bars, the last three often interrupted at their extremities; breaking up into irregular spots towards the spinners. Legs, sternum, and labium deep brown, clothed with black hairs and dark grey pubescence. Mandibles black, clothed above with rufous pubescence.

Carapace longer than broad; cephalic area more than half the length of the carapace. Central fovea deeply recurved;

thoracic striæ well marked. *Ocular tumulus* three times as long as wide. Anterior central eyes less than a radius apart, and from the anterior laterals their diameter distinctly less than the axis of the anterior laterals. Posterior centrals the smallest, pyriform, half their axis from anterior centrals, in contact with posterior laterals. Axis of posterior laterals more than half as long as that of anterior laterals, less than half their short diameter from them[1]. Anterior row straight.

Mandibles parallel-sided. Fang-groove armed on the inner margin with a row of 12 stout conical teeth (the number varies). Outer margin fringed with rufous hairs, bearing towards their base 6 separate isolated hairs, thickened towards their base.

Sternum longer than broad. Sigilla i., ii., iii., iv. well marked, submarginal. *Labium* broader than long, not cuspidate. *Coxa of pedipalp* twice as long as wide. Anterior basal angle cuspidate (as in *M. rufescens* and *M. sanguineus*). Anterior apical angle slightly produced, not cuspidate. Inner side of joint bearing towards the base a series of 7 stout, curved spines, and one smaller one on the central ridge; these, together with the thickened hairs on the base of the mandible, constitute the "lyra" and "pecten" of the stridulating-organ.

Legs similar in general character to those of *M. sanguineus*. Femora not spinose. Patella i., ii., iii., iv. not spinose. Tibiæ i. and ii. with a few spines beneath; iii. and iv. with a few spines at the sides and spiniform hairs below. Protarsi i. and ii. with 3–4 spines respectively beneath; on iii. and iv. more numerous. Tarsi short, slightly curved, transversely striate above; i. and ii. scopulate; iii. and iv. not scopulate. Tarsal claws 3; superior pair with a double series of 6–7 denticles beneath. Tarsus of pedipalp with a single claw, armed beneath with a single row of 5 or 6 denticles.

Abdomen similar in general character to that of *M. sanguineus*. *Mamillæ* four: posterior pair a little longer than abdomen; all three joints equal in length; anterior pair half as long as the basal joint of the superior pair, less than the length of one of them apart.

Comparative measurements in millimetres.— ♀. Carap. 9 long., 8 lat. Abd. 11 long., 6·5 lat. Cephl. area 5·5 long. Stern. 4·5 long., 3·5 lat. Coxa of pedipalp 3 long., 2 lat. Pedes, long. i. 30—ii. 29—iii. 27—iv. 34. Artl. i. long. 4·25—2—7·5—3·25—5·5—5·5—3. Artl. iv. long. 3·5—1·75—8—3—6—8—4. Postr. mam. 12 long. Artl. 4—4—4. Antr. mam. 2 long., 1·5 sept.

Many examples of the female sex only were obtained under logs in the forest near Santarem. The web is of the "Agelenoid" type, and is often constructed under banks along the bridle-tracks, assuming

[1] The measurements of the eyes are very untrustworthy, for they vary with almost every specimen. One female before me has the right anterior lateral eye entirely obsolete, while the area where it would normally be placed shows no trace of the organ. The right posterior lateral has at the same time an axis longer than the diameter of the anterior centrals.

in these situations the appearance of the webs of *Tegenaria*. No males were met with, and the greater part of the specimens obtained were immature.

The following species of this group have been described from South America, but none of them appear to be identical with those which I have met with on the Amazons :—

Thalerothele fasciata, Bertk. (♀, 14 mm. long), Verzeichniss der Brasil. Arach. p. 24, 1880, fig. 2. *Hab.* Rio Janeiro; Venezuela and Colombia.—Of this species Bertkau remarks, "scopula nulla;" while *M. sanguineus*, *M. niger*, and *Harmonica rufescens* possess the scopula. This species also exhibits abdominal markings, so that it cannot be identical with *H. rufescens*.

Diplura soricina, E. Sim. (♀, ceph. 9 mm. long), Ann. Soc. Ent. Fr. p. 189 (1889). *Hab.* Caraça.—M. Simon's note, "Abdomen fuscum, crebre testaceo punctatum, in medio maculis fulvis uniseriatis," proves that his species is not identical with either of the above three species.

Diplura bicolor, E. Sim. (♀, 15 mm. long), Ann. Soc. Ent. Fr. p. 215 (1889). *Hab.* Caraça, Brazil.—The diagnosis "Cephalothorax fulvo-rufescens"—"abdomen oblongum, atrum"—"in parte secunda utrinque inordinate testaceo punctatum, subtus late et crebre testaceo variegatum," will not apply to either of the species under consideration.

Diplura gymnognatha, Bertk. (♀, 19 mm. long), Verz. der Brasilianischen Arachniden, 1880, p. 21.—"Hinterleib mehr gelbbraun, Bauchseite heller"—"Grundfarbe des Cephalothorax rothbraun." Certainly not one of the three here described.

Diplura longicauda, Auss. (♀, carapace 10 mm. long), Verhandlungen der k. k. zool.-bot. etc. 1871, p. 179. *Hab.* Quito. Type in coll. Univers. Vienna.—Ausserer makes no mention of any blotches on the abdomen; and the spinners are far longer in proportion than those of *H. rufescens*.

Diplura æquatorialis, Auss. (♀), *op. cit.* 1871.—Very similar to but larger than *longicauda*. *Hab.* Cordilleras, Ecuador. Type in coll. Vienna University.—Central anterior eyes one-half larger than laterals (sec. Ausserer).

Diplura rogenhoferi, Auss. (♀, 19 mm. long), *op. cit.* 1871. *Hab.* Brazil.—"Obere Spinnwarzen so lang als das Abdomen." "Abdomen braun, mit 6 nach hinten gebogenen, dünnen, weisslichen Querstreifen, die sich gegen den Bauch verlieren." Central anterior eyes larger than laterals (sec. Ausserer).

Diplura cousini, E. Sim. (♀, 22–25 mm. long), Act. Soc. Bordeaux, 1889, p. 400. *Hab.* Quito.—Labium with spinules at apex. Central anterior eyes a little smaller than laterals (sec. Simon).

Genus Ischnothele, Ausserer, 1876.

Type. *Ischnothele caudata*, Auss., ♀. *Hab.* Yucatan, Mexico. Verhandl. der k. k. zool.-bot. Gesell. Wien, 1876, p. 163. Type specimen in coll. Brit. Mus. Nat. Hist.

In Ann. Mag. Nat. Hist. ser. 6, vol. xvi. p. 224, 1895, Mr. R. I. Pocock has already pointed out that the type specimen of *Ischnothele caudata*, Auss., is congeneric with examples of a Spider which have been identified by M. Simon as *Mygale guyanensis*, Walck., from the island of St. Vincent, West Indies, these being also in the British Museum of Natural History, South Kensington.

M. Simon has, however (Hist. Nat. Ar. 1892, i. p. 187), referred *M. guyanensis* to Karsch's genus *Thelechoris*, created in 1881 for a Spider found in Madagascar, as though congeneric with it and with *T. striatipes*, Sim., also from Madagascar. The latter, M. Simon, on the authority of Dr. Lenz of Lübeck, now regards as identical with Karsch's species *T. rutenbergi*, the type of *Thelechoris*.

Whether this form is really congeneric with *M. guyanensis*, and therefore with *I. caudata*, Auss., the type of Ausserer's genus *Ischnothele* created in 1875, I am not, of course, in a position to decide. But even if it were, the generic name *Ischnothele* has priority over *Thelechoris*, as Mr. Pocock has already remarked.

Whether, too, the form regarded as *M. guyanensis*, Walck., by M. Simon is really the form which Walckenaer had before him, I am, of course, unable to say; but from the fact that the former is abundant in Guyana, the isle of St. Vincent, and in North Brazil (sec. Simon), one would regard it as highly probable, though not absolutely certain on this account.

In any case, unless M. Simon has seen the types, such an identification must be regarded not as *Ischnothele guyanensis* (Walck.) but as *Ischnothele guyanensis* (Walck.)—(Sim.), the brackets signifying that the form was described or referred to by these authors under some generic name other than *Ischnothele*, while the "— (Sim.)" indicates that the form is not necessarily in reality Walckenaer's form but M. Simon's identification of it.

It may be convenient enough to regard the "*first identification*" by an author of a form of which the type no longer exists, and the description and figure do not furnish conclusive evidence as to its identity, as *correct*. Such an identification, however, even though universally adopted for the sake of convenience, is not, on this account alone, of necessity the right one.

ISCHNOTHELE SIEMENSI, n. sp. (Plate XXXV. figs. 7, 9, 15.)

♀. 18 mm. long. Type in coll. Brit. Mus. Nat. Hist. 1896.

Hab. Lower Amazons, everywhere, from Pará—Manãos.

♀.—*Colour*. Carapace testaceous brown, broadly margined with pale rufous-yellow hairs; mandibles black-brown. *Abdomen* black or deep brown, with a central dorsal longitudinal rufous silver-white band on the posterior three-quarters; broad in front, narrowed behind, with four and often five short oblique branches; spinners brown; ventral surface pale brown. *Sternum*, coxa, and trochanter of legs and pedipalp testaceous brown; the coxa of latter margined anteriorly with yellow. Femora and patella of legs dusky black; tibia, protarsus, and tarsus dull orange-brown.

Carapace compressed. Cephalic area slightly raised. Eye-

tumulus low; anterior row of eyes a little procurved (posterior margin of laterals aligned with centre of medians); the latter circular, half a diameter apart, the same distance from laterals, their diameter distinctly less than axis of laterals. Laterals ellipsoidal, distinctly separate, anterior a trifle larger than posterior. Central posteriors very small, equidistant from central anterior and posterior laterals [1].

Sternum a trifle longer than broad; four pairs of sigilla visible—1st pair at base of labial plate; 2nd, 3rd, and 4th small, marginal. *Labium* broader than long, not spinulose. Coxa of pedipalp ⅓ longer than broad; anterior distal angle slightly produced and bluffly rounded, not spinulose; basal anterior angle and central basal disk studded with minute cuspules. *Legs* 4, 1, 2, 3. Femora clothed beneath with long silky hairs; other segments similarly, though less thickly. Tibiæ, protarsi, and tarsi with a few spines beneath, especially iii. and iv.

Spinners four. Posteriors as long as abdomen, trisegmental; two basal segments subequal, normal; terminal 1 mm. longer than both basals taken together, flexuose, caudiform, attenuate at apex; separate at base a distance equal to length of both basals taken together. Anterior spinners 2 mm. long, separate at base ⅓ longer than one of them. Tarsal claws three, superiors armed with 10–11 long denticles, inferior with four or five. Outer margin of fang-groove with 10 stout teeth, inner margin with 9; a third row of minute cusps close to outer row on inner side at base.

Measurements in millimetres (largest specimen).—♀. Carap. 7 long., 5·5 lat. Abd. 11 long., 8·25 lat. Stern. 3 long., 2·5 lat. Coxa of pedipalp 2 long., 1·5 lat. Pedes 4, 1, 2, 3—iv. 13 long. Postr. mam. 11 long. Artl. 3—2·75—5·25 long., 4 separate. Antr. mam. 2 long., 2·5 separate. Mandibles 3 long.

This species is, without any doubt, one of the most abundant spiders on the Lower Amazons. It abounds almost everywhere, forming its white, sheet-like web, constructed sometimes in tiers, one sheet above the other, under the bark of trees, amongst foliage, in the hollow centres and amongst the spikes of pine-apple plants, and in the crevices and crannies of ruined buildings. Occasionally, too, they are constructed, like those of our *Agelena*, on the ground. In general character the Spiders bear a strong resemblance to this genus as well as to *Textrix*, and the speed of their rapid retreat reminds one very much of the latter Spider. The web, too, is very similar to that of *Tegenaria* or *Textrix* in character. Though so abundant, they are not easily secured on account of their rapidity, and I was unfortunate in not securing a single male. It occurred everywhere from Pará to Manãos, along the river margin and in the forest on the "terra firma." Whether it extends far north or south I cannot say, though I should not be surprised to find it through the entire valley of the Amazons. The species forms an addition to the Museum collection.

[1] These characters must be used with great caution.

The following species belonging to this genus have been described from the West Indies, Central America, and Brazil:—

I. caudata, Auss., ♀. Type of genus *Ischnothele*; in. coll. Brit. Mus. Nat. Hist. *Hab.* Yucatan, Mexico.—Verhandlungen etc. Wien, 1876, p. 153.

I. guyanensis (Walck.)—(Sim.), ♂ (sub *Mygale*). *Hab.* Guyana. —Ins. Apt. i. 1837, p. 231.

I. zebrina (E. Sim.), ♀ (sub *Thelechoris*), Actes Soc. L. Bordeaux, xliv. p. 321, 1891 & 1892. *Hab.* Nicaragua.

I. digitata (Cambr.), ♂ ♀ (sub *Macrothele*). *Hab.* Guatemala. —Biol. Centr.-Amer., Aran. 1891, p. 92, pl. xii. fig. 3. Type in coll. O. P. C.

I. pusilla (E. Sim.), ♂ ♀ (sub *Entomothele*). *Hab.* Venezuela.—Ann. Soc. Ent. Fr. 1888, p. 246.

NOTE.—*Thelechoris rutenbergi*, Karsch, type of genus *Thelechoris*, Abhl. d. naturw. Ver. Bremen, vii. 1881, p. 196, is a native of Madagascar, and may or may not be congeneric with *I. caudata*, Auss., and *I. guyanensis*, Walck.

Thelechoris striatipes (Sim.) (sub *Entomothele*), Ann. Soc. Ent. Fr. 1888, p. 246, is also a native of Madagascar, and is set down as a synonym of *T. rutenbergi* by M. Simon, on the authority of Dr. Lenz, in Hist. Nat. Ar. i. 1892, p. 187.

Table of Specific Characters.

A. Carapace unicolorous testaceous brown.
1. Abdomen unicolorous; clothed with silky rufous-golden pubescence. (11 mm. long, ♀.) ..... *I. caudata*, Auss.
2. Abdomen with central dorsal longitudinal series of transverse dull orange ∧-shaped bars, the first half separate, the second united on the median line. Sides towards apex speckled with dull orange spots.
a. Size larger, 18 mm. long, ♀ ..... *I. digitata* (Cambr.).
b. Size smaller, 10–11 mm. long. (Females.)
* Abdomen black, spotted with dull testaceous, and on the second half ornamented with two rows of short, oblique, testaceous lines, three on each side.
Anterior row of eyes, seen from above, forming an almost straight line. Anterior centrals slightly smaller than laterals. Laterals on either side all but in contact with each other. The anterior lateral larger than the posterior lateral ..... *I. zebrina* (E. Sim.).
** Abdomen dull purple-brown, speckled with dull testaceous spots on sides towards apex; with central dorsal longitudinal series of 6 transverse dull orange ∧-shaped bars, the first three separate, the second three united on the median line.
Anterior row of eyes slightly procurved (posterior margin of laterals aligned with centre of medians). Anterior centrals slightly smaller than laterals. Laterals distinctly separate; anteriors slightly larger than posteriors ..... *I. guyanensis* (Walck.).

B. Carapace testaceous brown, margined with a broad band of dull orange silky pubescence.	
1. Size larger, 18 mm. long (♀).—Central anterior eyes slightly smaller than laterals. Anterior row slightly procurved; (posterior margin of laterals aligned with centre of medians). Laterals distinctly separate, subequal, anteriors a little larger. Abdomen with central, longitudinal, silver-white rufous lanceolate band, broad in front, narrowed behind, on apical three-quarters, with four, or sometimes five, short oblique branching lines	*I. siemensi*, n. sp.
2. Size smaller, 10 mm. (♀).—Central anterior eyes a little larger than laterals. Laterals scarcely separate; anteriors larger than posteriors. Abdomen with central longitudinal band of silver-white-rufous marks ("vitta"), not reaching anterior margin, broad in front, narrowed behind, with four short branches on either side ("quadripennata") ...	*I. pusilla* (E. Sim.).

Remarks.—The characters of *I. digitata*, *I. caudata*, and *I. siemensi* are taken from the type specimens. Those of *I. guyanensis* from females from St. Vincent, identified by M. Simon; e coll. Brit. Mus. Nat. Hist. Those of *I. zebrina* and *I. pusilla* are taken from M. Simon's descriptions of the two species. As to the first four there can be no doubt about their distinctness as species; I am not so convinced, however, as to the distinction between *I. zebrina* and *I. guyanensis*. M. Simon thinks that probably *I. zebrina* and *I. digitata* are identical.

The chief distinction drawn by M. Simon between the first two is based on the difference between the anterior eyes: "*lineam subrectam formantibus*" in *zebrina*; in *guyanensis* "*lineam leviter procurvam.*" I must confess that I am unable myself to appreciate the distinction between "*a line almost straight*" and "*a line slightly curved.*" The other character, however, given in *I. zebrina*, "*oculis lateralibus subæquis et utrinque juxta contiguis*," as contrasted with "*oculis lateralibus distincte separatis et antico postico majore*" in *I. guyanensis*, may be a good one, provided it is drawn from a long series of adult examples. The oblique bars in *I. guyanensis* are six in number, the first 3 not united on the median line; of *I. zebrina* M. Simon says, "*abdomen atrum in parte secunda lineis testaceis obliquis et abbreviatis biseriatis, utrinque tribus, ornatum.*"

If *I. zebrina* (11 mm. long) and *I. digitata* (18 mm. long) are identical, the characters of the former have possibly been taken from an immature female. *I. pusilla*, too, must be closely allied to *I. siemensi*, though the great difference in the size furnishes a strong presumption that they are distinct.

EXPLANATION OF THE PLATES.

Plate XXXIII.

Fig. 1. *Melodeus sanguineus*, n. sp., ♀ (p. 758). Dorsal aspect.
2. „ *niger*, n. sp., ♀ (p. 759). Dorsal aspect.

Fig. 3. *Harmonicon rufescens*, n. sp., ♀ (p. 756). Abdomen in profile.
4. *Melodeus sanguineus*, n. sp., ♀ (p. 758) Abdomen in profile.
5. „ *niger*, n. sp., ♀ (p. 759). Abdomen in profile.
6. *Harmonicon rufescens*, n. sp., ♀ (p. 756). Leg i. in profile.
7. *Melodeus sanguineus*, n. sp., ♀ (p. 758). Leg i. in profile.
8. *Santaremia pococki*, n. sp., ♀ (p. 746). Full figure; dorsal aspect.
9. „ „ „ „ Sternum.
10. *Avicularia avicularia*, ♀ (p. 741). Sternum.
11. „ „ „ Three terminal joints of leg iv.
12. „ *variegata*, n. sp., ♀ (p. 743). Three terminal joints of leg iv.
13. *Santaremia pococki*, n. sp., ♀ (p. 746). Profile.

Plate XXXIV.

Fig. 1. *Paratropis papilligera*, n. sp., ♀ (p. 723). Spinners from beneath.
2. *Anisaspoides gigantea*, n. sp., ♀ (p. 726). Spinners from beneath.
3. *Anisaspis tuberculata*, Sim., ♀ (p. 728). Spinners from beneath.
4. „ „ Labium, in profile.
5. „ „ Labium and coxa of pedipalp.
6. *Paratropis papilligera*, n. sp., ♂ (p. 723). Dorsal aspect.
7. „ „ Profile aspect.
8. „ „ Eye-tubercle in profile.
9. *Acanthodon petiti*, Guérin, ♀, type (p. 732). Eyes from above.
10. „ „ „ Base of mandible, beneath.
11. „ „ „ Labium and coxa of pedipalp.
12. „ „ „ Tarsal claws of first pair of legs.
13. „ *santaremia*, n. sp., ♀ (p. 733). Sternum.
14. *Homœoplacis austeni*, n. sp., ♂ (p. 735). Eyes from above.
15. „ „ Apex of tibia of first pair of legs.
16. „ „ (*a*) Tarsus i. (*b*) Tarsus iv.
17. *Acanthoscurria geniculata*, C. Koch, ♀ (p. 737). Leg i. from in front.
18. „ *brocklehursti*, n. sp., ♀ (p. 739). Leg i. from in front.
19. *Avicularia avicularia*, Linn., ♀ (p. 741). Eyes from above.
20. *Santaremia pococki*, n. sp., ♀ (p. 746). Eyes from above.
21. *Tapinauchenius sancti-vincenti*, Walck. (p. 744). Eyes from above.
22. *Anisaspoides gigantea*, n. sp., ♀ (p. 726). Protarsus and tarsus i.: profile.
23. *Paratropis papilligera*, n. sp., ♀ (p. 723). Tarsal claws of leg i.

Plate XXXV.

Fig. 1. *Melodeus sanguineus*, n. sp., ♀ (p. 758). Lyra from above.
2. *Harmonicon rufescens*, n. sp., ♀ (p. 756). Base of mandible with pecten.
3. „ „ „ Lyra from above.
4. *Fufius auricomis*, Sim., ♂ (p. 750). Tibia and base of protarsus i.
5. *Neodiplura jelskii*, n. sp., ♂ (p. 755). Apex of tibia and base of protarsus i.
6. *Fufius auricomis*, Sim., ♂ (p. 750). Eyes from above.
7. *Ischnothele siemensi*, n. sp., ♀ (p. 762). Spinners from beneath.
8. *Fufius auricomis*, n. sp., ♀ (p. 750). Spinners from beneath.
9. *Ischnothele siemensi*, n. sp., ♀ (p. 762). Dorsal aspect.
10. *Neodiplura jelskii*, n. sp., ♂ (p. 755). First leg, profile.
11. „ „ Tarsus and bulb of pedipalp of male.
12. *Santaremia pococki*, n. sp., ♀ (p. 746). Tarsal claws of leg i.
13. *Avicularia avicularia*, Linn., ♀ (p. 741). Tarsal claws of leg i.
14. (*a*) *Neodiplura jelskii*, n. sp., ♀ (p. 755), sternum. (*b*) *Melodeus sanguineus*, n. sp., ♀: sternum.
15. *Ischnothele siemensi*, n. sp., ♀ (p. 762). Base of mandible from below.
16. *Fufius auricomis*, Sim., ♂ (p. 750). Claws of tarsus i.
17. *Paratropis papilligera*, n. sp., ♂ (p. 723). Sternum.
18. *Actinopus wallacei*, n. sp., ♀ (p. 728). Base of mandible from beneath.

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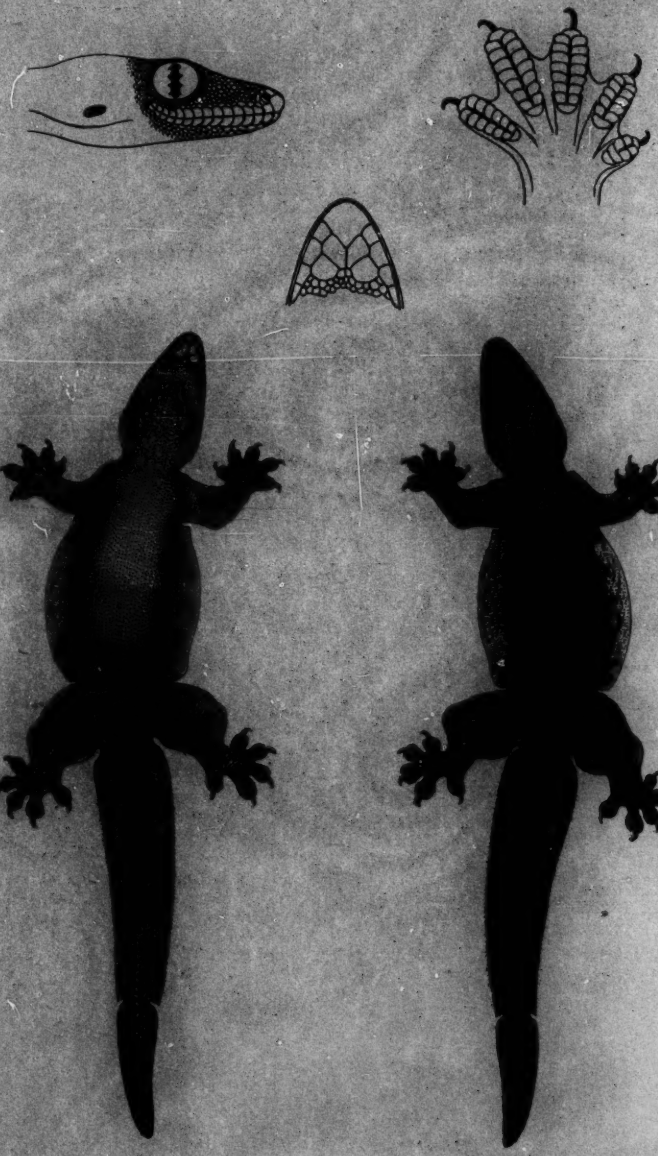


J. Green del. et lith. Mintern Bros. Chromo.

MIMETOZOON FLOWERI.

8. On a new Gecko from Penang.

By G. A. Boulenger, F.R.S.

[Received June 16, 1896.]

(Plate XXXVI.)

Among some Reptiles and Batrachians collected on Penang hill (at 2200 feet altitude) by Mr. Stanley Flower, and presented by him to the Natural History Museum, there was a new Gecko of particular interest. At a first glance it appears to be a *Ptychozoon*, that curious form of parachute-bearing Geckos of which we now know two species from South-eastern Asia, viz., *P. homalocephalum*, Crev., and *P. horsfieldii*, Gray. But this resemblance is merely a case of convergence, for whilst *Ptychozoon* is a modified form of *Gecko*, the new lizard is clearly derived from *Hemidactylus*. The gap between the species referred to *Gecko* and those on which *Ptychozoon* is based is so considerable, that the latter genus has been universally accepted by modern herpetologists. But in the present case the matter is not quite so simple; for we have long been acquainted with a species of *Hemidactylus*,—*H. platyurus*, Schn.,—which, by the presence of a well-developed fold along the side, foreshadows the development of the parachute of *Ptychozoon*; however, the scaling on these membranes does not show any modification, and therefore I have thought it fit to found a new genus for the species described below, which differs in the brick-like enlarged scales covering the side-membranes, as well as in the greater development of these membranes and the fuller web between the digits. If *Ptychozoon* deserves to stand as distinct from *Gecko*, it would be illogical not to allow the same rank to the new Penang Lizard. I therefore propose to name it *Mimetozoon floweri*.

Mimetozoon, gen. nov.

Digits extensively webbed, strongly dilated, with two rows of lamellæ beneath; the two distal phalanges compressed and slender, rising from within the extremity of the dilated portion; all the digits clawed. Limbs and sides of head, body, and tail with much-developed dermal expansions. Upper surfaces covered with juxtaposed granular scales and tubercles, the parachute-membrane covered above with imbricate tetragonal scales arranged like bricks. Pupil vertical.

Mimetozoon floweri, sp. nov. (Plate XXXVI.)

Head slightly distinct from neck; snout obtusely pointed, much longer than the distance between the eye and the ear-opening,

once and a half the diameter of the orbit; forehead concave; ear-opening oval, horizontal. Body and limbs much depressed; digits short, two-thirds webbed, inner short; five lamellæ under the inner digit, eight or nine under the fourth; limbs with dermal folds, the largest extending from the vent to the fifth toe. Tail much depressed, bordered on each side by a broad, entire, dermal fold with fringed edge. Rostral quadrangular, broader than deep; nostril pierced between the rostral and four scales; 12 upper and 10 lower labials; symphysial triangular; two pairs of chin-shields, the median forming a suture behind the symphysial. Head, back, and limbs covered with small granules, largest on the snout; occiput and back with numerous small, round, smooth tubercles; ventral scales small, cycloid, imbricate, smooth. Tail covered with small granular scales, the muscular portion with transverse rows of small smooth tubercles above, with a series of transverse shields beneath. Grey above, speckled with brown, with quadrangular dark spots disposed in pairs along the back, connected by brownish bands and wavy transverse lines, and confluent into cross-bars on the tail; a dark streak on each side of the head, passing through the eye; pale yellow beneath, speckled with blackish on the sides, the muscular portion of the tail coral-red. "Iris golden brown."

	millim.		millim.
Total length	115	Fore limb	17
Head	16	Hind limb.....	21
Width of head	9	Tail	56
Body	43		

The single specimen is a female.

kindness of Sir Wm. Flower I was selected to represent the Museum, the Trustees granting me the necessary leave of absence. Subsequently, in order that the Museum might benefit to the fullest possible extent, Mr. Siemens consented to take a second naturalist in the person of Mr. F. O. Pickard Cambridge, who, by the boundless enthusiasm and untiring energy with which he threw himself into the labour of collecting, more than justified the selection. The 'Faraday,' a vessel of 5000 tons, sailed from Gravesend on Dec. 13, 1895, and reached Pará on Jan. 4, 1896, after calling on the way at St. Vincent, in the Cape Verde Is., where we had a most enjoyable day's collecting on Dec. 26.

Before proceeding to offer a few remarks on some of the more interesting species encountered on the Amazon, the Society will perhaps allow me to give a brief outline of the course of the expedition, in order to explain the localities at which our collections were made and the conditions under which the work was carried out. The 'Faraday' remained at anchor in the Pará River, about two miles below the city, from Jan. 4th until the 10th. We were thus enabled to collect for several days in a clearing in the forest about three-quarters of a mile from our anchorage, besides paying what was unfortunately a very hurried visit to the Pará Museum. This institution, which is devoted to Natural History and Ethnography, is, of course, conducted upon purely faunistic lines, and, although it receives but slender assistance from the State, its zoological collections, under the energetic supervision of the present Director, Dr. E. A. Goeldi, who at the time of our visit had only been in charge for a year and a half, would do credit to any European city. The Museum is surrounded by a small but beautiful botanical garden, in which there are also a number of cages containing live animals.

On Jan. 10th we left Pará for the Amazon, paying out cable as we went, and on Jan. 13th reached Breves, a small town in the great island of Marajo, situated near the commencement of the network of narrow channels which connect the Pará River with the Amazon. At Breves we had a day's collecting, considerably troubled by uncertainty as to the hour at which the ship would proceed on her way. On the afternoon of the following day (Jan. 14th) we ran aground on a mudbank at the western end of a channel known as the Paraná de Buyassu, and remained there hard and fast until Jan. 20th, when we were towed off, only to run aground again on the following day in almost the same place, so that we did not get away finally until high-tide on the morning of Jan. 22nd. This delay, however annoying from a cable-laying point of view, was to a naturalist anything but unwelcome, and we turned it to good account. No further mishaps occurred on the upward voyage, and we reached Manaos, our destination, at the mouth of the Rio Negro, about 1000 miles from Pará, on Feb. 8th, after calling on our way at Gurupá, Monte Alegre, Santarem, Obydos, Parintins, and Itacoatiara. At each of these places we had from one to two days' collecting, according to

the time occupied by the cable-operations, with the exception of Santarem, where we remained for four days and a half. We left Manaos on the downward voyage on Feb. 15th, preceded two days earlier by Mr. Pickard Cambridge, who had decided to return to Santarem in order to stay for a fortnight in the forest some nine miles inland from that town, at a cottage which had been most kindly placed at our disposal by Mr. Wallace, an American trader. After due consideration I had decided to remain with the ship, in order to visit other localities near the mouth of the river, and so make the most of our opportunities by dividing our forces. On the downward voyage we ran aground in mid-stream near Monte Alegre, and remained there for four days before getting off. Unfortunatefy I was suffering at the time from a swollen foot, and being scarcely able to walk I was unable to profit by this delay. After another day's collecting at Gurupá, we reached Macapá on the northern shore on Feb. 24, and I was enabled to collect for a day at a locality which, so far as I am aware, had not been visited before by a European naturalist. Thence, after calling at Chaves, in the island of Marajo, and again at Breves, we returned to somewhere near our old anchorage in the Pará River on March 5th, and the expedition was nearly at an end. Connections, however, still had to be made with a few places in the vicinity of Pará, and, as it was expected that these operations would take at least a fortnight, I resolved to avail myself of an opportunity which occurred on the following day of going to stay for a time at Mosqueiro, a little place seventeen miles below Pará on the same shore, in order to make the utmost of the time that still remained for collecting. I remained here until March 16th, when the 'Faraday' arrived, and I returned in her to our anchorage below Pará. During the second half of my stay at Mosqueiro work was much interfered with by rain. Mr. Pickard-Cambridge, who had already returned from Santarem, now rejoined the ship, and the next few days were occupied mainly in preparations for the homeward voyage. We sailed from Pará at 6 A.M on March 24th, and reached Gravesend on the morning of April 14th.

On referring to my diary I find that, although we spent rather more than eleven weeks (79 days) on the Amazon and the Pará River, owing to the special conditions of the expedition, the actual number of days on which I was able to collect ashore amounted in the aggregate to only five weeks (35 days). Then, again, in considering results, it must be remembered that in our flying visits to the various localities already mentioned between Pará and Manaos we were often hampered by much uncertainty as to the exact time for which the ship would remain, and by the necessity for returning to the shore at a particular moment in order to catch the launch or boat going off to the ship. On the other hand, the days spent in steaming from place to place, and others on which we were unable to land, were by no means wasted, since the numbers of insects which were attracted by the ship's electric lights at night kept me pretty busily occupied.

Turning now to the harvest of the expedition, I may say at once that the collections we brought home consisted almost entirely of Arthropods. Mr. Pickard-Cambridge naturally devoted himself more particularly to Spiders, since they are his speciality, while I similarly looked after the Insects. But, apart from this, Mammals, with the exception of Bats and Dolphins, were conspicuous by their absence, while, as we had no one to assist us in skinning, it was impossible, in the time at our command, to do very much among the Birds. Reptiles and Amphibians were by no means abundant, and such as were met with prove, with a single exception, to belong to well-known and widely distributed forms. Among the Fishes it might have been possible to do something, but unfortunately a trap which I had brought with me was lost, owing to the breaking of a rope the second time it was put overboard.

Mammals.—The Lower Amazon and the adjacent waterways (including the Pará River and the maze of connecting channels) are shut in by dense forests, in which the naturalist unaccompanied by a guide might easily lose his way should he venture far from the narrow paths used by the rubber-gatherers. Around the small towns, however, there are more or less extensive clearings, while at Santarem there is a considerable tract of open country ("campo"). But in the forest itself, in the short time at my disposal, it was never possible to penetrate more than a few hundred yards from the river's brink. The entire absence of Mammals, or even of any traces of Mammals, in the forests near the shore of the river was most striking. I had included in my outfit a large number of traps of various kinds, but never found the slightest opportunity of using them. The shores of the Paraná de Buyassu and the other narrow channels between the Pará River and the Amazon are low, and the forests near the water are consequently exceedingly swampy, which may in some measure account for the absence of Mammals at this particular spot; but once in the Amazon itself the shores are much higher, though in many places, no doubt, still liable to submergence at the height of the rainy season.

A fair number of Bats was collected from time to time, most of which flew on board the ship, but in the absence of Mr. Oldfield Thomas they have not yet been examined, so that I am unable to say anything about them.

Freshwater Dolphins (*Inia geoffroyensis* and *Sotalia tucuxi*, or *S. fluviatilis*) were exceedingly common, especially in the neighbourhood of the Paraná de Buyassu and in the *furo*, or narrow channel leading up to Monte Alegre. The former species, which is much larger than the other and generally appears to be about seven feet in length, is either wholly pink or flesh-coloured or else entirely black or black above and pink beneath. I often wondered whether this difference in colour is sexual, as the two kinds are nearly always seen in company; anyhow the point would be well

worth elucidating. The appearance of the pink form as it rises to blow, seen against the pea-soupy background of the waters of the Amazon, is most striking. The *Sotalia* is black on the upper half of the body, which is all that I ever managed to see of it. It is stated by Bates ('The Naturalist on the River Amazons,' 6th ed. p. 75) that the natives call the larger species (*Inia geoffroyensis*) the "Bouto," while they term the smaller one (*Sotalia*) the "Tucuxí." According to one of our Brazilian pilots, Bates has transposed the native names; nevertheless I am inclined to think that the pilot himself must have been wrong, as it is difficult to believe that Bates, writing after eleven years' experience of the Amazon, could have made such a blunder. The pilot in question also stated that the large Dolphins (*Inia*) will attack a man in the water, while the small ones (*Sotalia*) will defend him by making an onslaught on the aggressors. If there is any truth in this statement it may be that the small Dolphin sometimes attacks the larger one, just as, according to Mr. Hudson ('The Naturalist in La Plata'), the Puma attacks the Jaguar whenever he meets him; but personally I never noticed anything of the sort, although I frequently saw the two species in close proximity in the same furo. I may add that Bates ('Naturalist on the Amazons,' 6th ed. p. 296) alludes to the number of fables that are told about the large Amazonian Dolphin, though he considers that "it is probable these did not originate with the Indians, but with the Portuguese colonists." The difference between the two species in their method of rising to the surface to blow is very noticeable and, as it seems to me, is not very clearly stated by Bates (*op. cit.* p. 75). The large black or pink Dolphin (*Inia geoffroyensis*) thrusts itself horizontally along the top of the water, usually showing the crest of its flat head first, and then nearly the entire length of the back, including the low dorsal fin; it then dives gently down head foremost. The small species (*Sotalia*) arches over out of the water, showing the curve of the back and the dorsal fin. Sir Wm. Flower was extremely anxious that I should, if possible, bring home a specimen of *Inia geoffroyensis*, or indeed of any one of the Amazonian Dolphins, and accordingly I made many attempts to shoot one but without success. The fishermen cannot be induced to harpoon them, and eventually we came to the conclusion that the only practicable means of securing a specimen would be to have a couple of big seine nets specially constructed for the purpose and to shoot them across one of the narrow furos, when the Dolphins might easily be captured.

In the creeks running out of the Rio Negro below Manaos I found Manatees (*Manatus* sp. inc.) not uncommon, and on more than one occasion I saw one make a tremendous commotion on the top of the water. In one instance the neck of the animal seemed to appear first, and it then turned "head over heels" as it were, and I distinctly saw the disk-shaped tail strike the water. This liveliness on the part of the Manatee in its natural state is perhaps worth noting, as in captivity it usually appears to be a

sluggish beast; at any rate a small specimen which I saw in the Public Gardens at Pará was particularly so.

Birds.—With regard to the Birds we met with I need say but little, as most of them belonged to well-known species. Hoazins (*Opisthocomus cristatus*) were extremely numerous in the bushes fringing the Paraná de Buyassu, and could be seen flapping about, balancing themselves on twigs, and uttering their harsh cries in all directions. In the furo leading to Monte Alegre we also found them abundant, and here they appeared to be in better plumage, if not to belong to a finer race than the Buyassu birds. On the Paraná de Buyassu and in the Monte Alegre furo a beautiful little Heron (*Butorides cyanurus*) was common and was often flushed out of the bushes. I may add that large white Herons, Egrets, and a bird closely resembling *Ardea cinerea* were frequently seen at various points along the shores of the river. Black Cuckoos (*Crotophaga major*) were another species common everywhere; these birds often associate in small flocks of half a dozen or more. At Monte Alegre I obtained a yellowish-brown Woodpecker (*Celeus ochraceus*) which is possibly of some value, as I find that we have only two other specimens of the species in the Museum collection. The only other bird to which I need refer is a beautiful little Goatsucker, which was one of two that I met with on the Rio Negro, hawking in the air about three miles below Manaos and on the opposite shore to the city. I did not observe this species anywhere else. The specimen, which is unfortunately a young bird, has been referred provisionally by Mr. Ogilvie Grant to *Nyctiprogne leucopygia*; however, it certainly belongs to a much smaller race than the typical form.

Reptiles and Amphibians.—I have already stated that among Reptiles and Amphibians, with a single exception (a small Frog), we met with nothing of any special interest. Strange to say we encountered no poisonous Snakes, and although constantly on the look out for the "hideous Sucurujú," as Bates calls the Anaconda (*Eunectes murinus*), we were never so fortunate as to see one, although wherever we enquired about it the natives invariably assured us that it occurred. Of Alligators, too, we only met with two or three small specimens. These creatures, though doubtless common enough, are, on the course followed by the steamers, extremely shy and seldom seen, although on a lagoon near Santarem I believe Mr. Pickard Cambridge observed a number of them.

The little Frog above alluded to (*Prostherapis femoralis*, Blgr.) was captured at Monte Alegre on Jan. 26th, and is the only specimen that has hitherto been obtained in Brazil. The species was described by Mr. Boulenger in 1894 from two specimens from Yurimaguas, on the Rio Huallaga, in Peru, and has until now been represented in the Museum collection only by the types and two other individuals from Ecuador.

Fishes.—Even had our fish-trap not been lost before it had done any service we should have had but little time to devote to fish-collecting. As it was I was unable to make any observations worth noting, since the colour of the water of the Amazon and the Pará River renders it impossible to see anything beneath the surface. However, it may perhaps be mentioned that a species of Cat-fish (Siluridæ) is extremely abundant in the Pará River, and appears to afford the chief occupation to the numerous fishing-boats. When landing on the shores of the Pará River or of the lower reaches of the Amazon a small fish, looking something like a Gurnet, is frequently seen leaping along the surface of the water. It appears to represent a Flying-fish in a semi-evolved condition, and is known to the English residents at Pará as the "Uplooker," but, as I was unable to secure a specimen, I cannot say anything as to its affinities.

Molluscs.—The shells of two or three species of *Ampullaria* were common enough in the forests near the river, but most of them were dead and consequently of little value as specimens; we were told that the natives living on the banks use these great Snails as food.

Insects.—The total number of Insects of all Orders collected amounted to about 2500, a figure which might have been exceeded considerably had any special attempt been made to secure Butterflies; it was, however, deemed advisable to devote most attention to the more obscure and less popular Orders. The time of year, being at the commencement of the rainy season, was probably not the most favourable one for Insect-collecting, as, with the exception of Dragonflies, Insects were not so abundant as might have been expected. Of the specimens obtained of the various Orders the Diptera form the largest individual total (476); next come the Hymenoptera (415), the Lepidoptera Heterocera (390), and the Coleoptera (280). Allusion has already been made to the number of insects that visited the ship's electric lights at night. Although after dark all the lighted parts of the ship formed more or less happy hunting-grounds, two reflectors, each containing six glow-lamps of 16 candle-power, which hung over the 'Faraday's' stern, were the most productive. These lights were always kept going during cable-laying by night, and when we happened to be anywhere near either shore the number of insects that visited them was most remarkable. Of these nocturnal visitants Moths naturally formed the largest proportion, but, curiously enough, a small species of Horse-fly (*Tabanus*) also came in large numbers, besides certain other smaller Diptera, all of which are usually supposed to be diurnal. When we were at anchor off some of the small towns the 'Faraday's' projector lamp, which gave a beam of light equivalent to that of from 25,000 to 30,000 candles, was occasionally used to astonish the inhabitants, and never failed to attract numbers of insects, especially some of the larger Moths

and Locusts. It was, however, noticed that as we proceeded further up the river the number of insects that visited us by night sensibly diminished. The reason for this I am at a loss to understand; but the same observation was made by Mr. Bernard Piffard, a naturalist who passed up the river about the same time as ourselves on board one of the boats of the Red Cross Line.

Hymenoptera.—As regards this Order my best day's collecting was at Obydos, where on Feb. 2nd I was fortunate in finding a large bush in full flower and covered with specimens of a great variety of species. At each locality visited the most conspicuous and commonest of the large Hymenoptera were various species of *Pepsis*, while the common Wasp of the Lower Amazon and the Pará River was found to be *Polistes canadensis*, Linn. This species abounds everywhere, and numbers of its stalked nests are to be found attached to the rafters in every open shed or similar building; they were particularly noticeable inside a little mortuary chapel in the cemetery at Itacoatiara. Here and there on the Paraná de Buyassu, as well as at Gurupá and other places, a long, white, cylindriform object was observed hanging to the branch of a tree; this was the nest of the Card-making Wasp (*Chartergus chartarius*, Oliv.). The natives are extremely fond of these nests as ornaments for their houses. Some of the Bees met with seemed particularly inquisitive creatures: thus in clearings in the forest *Chrysantheda nitida*, Perty, a small species of a brilliant metallic green, hovers around one, or over any article one may have thrown upon the ground, as if inspired with the utmost curiosity; while, when steaming about in the ship's launch at Buyassu, a large reddish-brown species of *Epicharis* hummed round us in sweeping curves, and by its actions led us to mistake it for a Horse-fly (*Tabanus*). Among the various species of Ants the well-known Saübas, or Leaf-carrying Ants (*Atta* spp.), were by far the most noticeable, and were abundant in the more open places everywhere. When collecting in a clearing one frequently came upon a narrow moving column of small green leaves, or rather segments of leaves, crossing one's path and meandering away in either direction as far as the eye could trace it among the herbage, the insects themselves often being entirely concealed by their burdens.

Diptera were by no means so abundant as I had hoped, and the majority of the species met with were not very striking. The comparative scarcity of species of this Order must have been due to the season of the year, as I failed to come across numbers of fine species taken by Bates at the very localities we visited. Unfortunately none of Bates's Diptera in the collection of the British Museum are labelled with the date of capture. I am happy to say that I secured a fair series of specimens, representing a number of species, of the much-abused but rarely-collected Mosquito (*Culex*). Although in the forest Mosquitoes always made their presence felt, the only place where I found them really troublesome was *Macapá*; here they literally swarmed round me in clouds, and collecting quickly became a source of pain and grief.

With the exception of one or two species of *Eristalis*[1] and *Volucella obesa*, F., scarcely any Hover-flies (Syrphidæ) were seen. *Volucella obesa*, a brilliant metallic-green species, which also has bright green eyes when alive, is very widely distributed throughout the Neotropical Region. Like the Bee (*Chrysantheda nitida*), which it closely resembles when on the wing, this fly is the victim of an overpowering curiosity, and remains poised in the air in front of one in a way that is perfectly irritating. It seems to be an exceedingly stupid fly, and when caught in the net its movements at once become dull and sluggish. I found it very common everywhere. In houses and on board ship the Common House-fly of Europe (*Musca domestica*, L.) was unpleasantly numerous; indeed I have never met with it in such swarms as on the dinner-table of a house about two miles from Pará. The species seems to be now universally distributed, and has doubtless been carried by ships all over the civilized world. Several species of *Calobata*, a narrow-bodied, long-legged fly belonging to the family Micropezidæ, occur in the forest at the water's edge, and were quite the characteristic Diptera at the Paraná de Buyassu. I shall have occasion to revert to the genus directly in speaking of Mimicry.

Of the *Butterflies* I can say but little, since, as I have already indicated, not much attention was paid to them. Many of the specimens taken were tattered and worn, a fact which seemed to afford further proof that the best collecting season was already over when we arrived. Several magnificent species of *Morpho* were seen flapping majestically along forest-paths or over clearings, but proved themselves singularly difficult to catch. I may add that at Santarem at the end of January the beautiful *Callithea sapphira*, Hübn., was quite common.

The majority of the *Moths* that visited the ship's lights were of small size, and our series when worked out will no doubt be found to include many new species. To a different category belongs the beautiful green-striped *Urania leilus*, L., which, although exceedingly common, I cannot refrain from mentioning. This species is diurnal in habits, and on our arrival at Pará a specimen came drifting over the ship almost as soon as the anchors were let go. Its appearance caused immense excitement, but we soon found that the moths kept crossing the river singly or in couples throughout the day. If my memory serves me they all flew from the direction of the Ilha das Onças towards the opposite shore, that is from north to south. These moths were also our constant companions when the ship was in the "Narrows" between the Pará River and the Amazon.

Coleoptera.—One, at any rate, of the Beetles collected is of interest. This is a male of the curious little scarlet-and-black Longicorn *Erythroplatys corallifer*, White, which I took at Obydos on Feb. 2nd. The species is at present represented in the Museum collection only by the type, which is a female.

[1] *Eristalis vinetorum*, Fabr., *E. agrorum*, Fabr., and *E. lateralis*, Walk.

For some reason we did not meet with a single specimen of the well-known "fire-flies" belonging to the genus *Pyrophorus*, either on the Pará River or the Amazon itself, although I believe they were found by Mr. Pickard Cambridge in the forest near Santarem. Fire-flies of the family Lampyridæ, however, of which our common English Glow-worm (*Lampyris noctiluca*, L.) is a well-known example, visited the ship in numbers by night as we proceeded up the river. They were especially conspicuous in the Monte Alegre furo on the night of Feb. 17, flashing out like sparks against the dark background of trees, and scintillating at intervals as they occasionally floated over our launch. Most of the species collected belong to the genus *Aspidosoma*, including among others *A. maculatum*, Deg., and *A. hesperum*, L. In the campo at Santarem on Jan. 29 we took a handsome species of Dung-Beetle (*Phanœus mimas*, L.), the passage of some cattle along the sandy road affording us an opportunity of observing the wonderful rapidity with which these beetles appear on the scene and bury themselves within a few minutes of the requisite attraction being provided for them.

The only other insects to which I need now refer are the Dragonflies (*Neuroptera Odonata*). As might naturally be expected in such a land of waters this Order was perhaps more in evidence than any other, and was particularly well represented in individuals, although the actual number of species met with was not very great. Though some of the species, again, were exceedingly beautiful in colour when alive, in size they in no way surpassed our British forms. The remarkable ease with which a Dragonfly, even when coming straight towards his would-be captor, contrives to elude the net is well known; for some reason I invariably found the rarer species the most difficult to catch; the common ones gave little trouble. I frequently had the opportunity of observing how a Dragonfly drinks; hovering motionless a foot or two above the water he suddenly makes a sharp dart forwards at it, striking it with his mouth and the underside of the thorax, and at once withdrawing to his previous position; the process is repeated several times.

Mimicry.—Three cases of apparently genuine mimicry among Insects, which came under my notice, seem worthy of mention. The first, which has probably not been recorded before, is that of a small Clearwing Moth (fam. Sesiidæ), which is an almost exact replica of a Wasp (*Polybia phthisica*, F.), of which I obtained several specimens at Manaos and the Paraná de Buyassu. In size and general coloration the two insects are the same, and the pattern of orange and black stripes on the thorax of the Wasp is copied so closely by the Moth that at a little distance it would puzzle even an entomologist to distinguish the two species. Unfortunately, I only obtained a single specimen of the Clearwing; it is not represented in the Museum collection, and is very probably new.

The second case of apparent mimicry, to which I would draw attention, is that of the Dipterous genus *Calobata*, alluded to above.

As has already been mentioned, the flies belonging to this genus have narrow bodies and long legs, while in many species the front tarsi are white. A medium-sized reddish *Calobata* (possibly new), which I found at the Paraná de Buyassu, when at rest on a leaf looks exactly like an Ichneumon of the genus *Cryptus*, holding its fore legs in the air and waving them about just as an Ichneumon waves its antennæ. The front tarsi of this species of *Calobata* are white, and since all the species of *Cryptus* have white-banded antennæ the resemblance is greatly increased. But as Ichneumons are not armed with stings, while, on the other hand, they attack larvæ and not perfect insects, it is difficult to see what benefit the fly can obtain unless the species of *Cryptus* are distasteful to birds.

The third instance of protective resemblance belongs to a different category. Among other Dragonflies, *Zenithoptera americana*, L., a small dark-winged Libellulid, was not uncommon. At Gurupá, on Feb. 22, I noticed that these insects have a habit of settling on the tips of dead twigs from five to ten feet from the ground, and drooping their wings downwards and forwards, so that they look exactly like bunches of dead leaves. Three or four individuals are usually seen on adjacent twigs, and they will remain motionless in this way for several minutes. I am informed by my friend Colonel Bingham, F.Z.S., that he has observed similar habits in the case of certain species of Dragonflies in India.

Since my time was fully occupied with the Insects, I cannot say much about the remaining Classes of Arthropods; nor is it necessary that I should do so, since these groups (Spiders, Scorpions, Myriopods, and *Peripatus*) were the special care of Mr. Pickard Cambridge, the results of whose study of the large Hairy Spiders (fam. Therephosidæ) are to be communicated to the Society to-night. These particular Spiders, the monsters of their class, were more or less common at most of the localities visited by us, and Mr. Pickard Cambridge's exertions were rewarded by the acquisition of a large series of specimens, including, I believe, representatives of a number of new species. On landing for the first time on the shores of the Pará River after a slight detour rendered necessary by the presence of a dead bullock, attended by the inevitable Urubú Vulture (*Cathartes atratus*), the first object that met our delighted gaze was one of these Spiders on the stem of a palm-tree. The common species in the vicinity of Pará was *Avicularia avicularia*, L., of which a specimen was found in almost every palm-stump in a clearing to which we paid several visits. These great spiders rarely leave their retreat during the day, but seem fond of sitting at the mouths of their holes, with the tips of their legs projecting from beneath a protecting layer of thick web. They are very timid, and almost invariably dart back into their holes when approached. In the case of the individuals living in the palm-stumps, however, a lighted match dropped into the hole was found to be an excellent means of effecting an immediate capture. Other species live in leaves, or in bag-webs beneath loose pieces of bark on tree trunks, while in the campo at Santarem a new species of *Tapinauchenius*

was found to be very common in holes in the sandy ground. A number of these nests were dug up bodily and brought home in biscuit-boxes by Mr. Pickard Cambridge, and when duly mounted it is hoped that they will prove interesting exhibits in the Museum galleries. Scorpions were by no means common, although by dint of much searching Mr. Pickard Cambridge managed to secure specimens of several species. A number of the somewhat Crab-like Phrynidæ (Pedipalpi) were obtained, and in the campo at Santarem I was fortunate enough to dislodge a whole family of *Tarantula santarensis*, Pocock, both young and adults, from an ant-hillock. On thrusting a stick down the holes in the nest the ants swarmed out in large numbers, accompanied by these strange guests, among which was a large yellow Cockroach (*Blabera* sp.), more usually met with in houses. Centipedes were neither very large nor particularly common, but a rich harvest of Millipedes was secured, and Mr. Pickard Cambridge also obtained several specimens of *Peripatus*.

Freshwater Sponges.—In the branches of bushes and low trees lining the western shore of the Rio Negro below Manaos two species of freshwater Sponges (*Tubella reticulata*, Bowerb., and *Parmula batesii*, Bowerb.) were very common, forming spiny masses resembling suspended Hedgehogs. At the time of our visit the water had scarcely begun to rise, and these Sponges were consequently hanging high and dry from five to fifteen feet above the surface. In the case of *Parmula batesii* the sponge network was full of blackish seed-like gemmules. Since our return attempts have been made to induce some of these to develop by immersion in water at various temperatures, but as yet unfortunately without success.

I cannot conclude without a few words of grateful thanks: in the first place to Mr. Alexander Siemens, whose never-failing kindness to my colleague and myself while on board his ship will always be a pleasant memory to both of us, and who, in the midst of the numberless cares and anxieties of an important commercial undertaking, did everything in his power to make our part of the expedition a success; in the second place to Sir William Flower for selecting me to represent the Museum; and, lastly, to the Trustees of the British Museum for granting me the necessary leave of absence, which enabled me, if only for a brief space, to cease from being what Mr. Wallace has called a "laboratory naturalist," and to get a glimpse of the appearance and habits of birds, and beasts, and insects while they are yet living creatures and before they become museum specimens.

November 17, 1896.

Dr. St. George Mivart, F.R.S., V.P., in the Chair.

The Secretary read the following reports on the additions made to the Society's Menagerie during the months of June, July, August, September, and October, 1896 :—

The registered additions to the Society's Menagerie during the month of June were 163, of which 83 were by presentation, 28 by purchase, 21 by birth, and 31 were received on deposit. The total number of departures during the same period, by death and removals, was 93.

The most noticeable additions during the month were :—

1. An Occipital Vulture (*Vultur occipitalis*), from South Africa, obtained by purchase June 24th. This fine Vulture is rather scarce in collections; no example of it has been in the Society's Gardens since 1865.

2. A Baer's Duck (*Fuligula baeri*), received from Mr. Frank Finn, F.Z.S., of the Indian Museum, Calcutta, and presented by him, along with other birds, to the Society's Collection. This is the first example of this eastern Asiatic Duck, which has recently been ascertained to occur in India [1], that has reached us.

3. A Temminck's Pangolin (*Manis temminckii*), said to have been procured in the Transvaal, and received on deposit June 29th.

The registered additions to the Society's Menagerie during the month of July were 183 in number; of these 64 were acquired by presentation, 11 by purchase, 21 by birth, 68 were received on deposit, and 19 in exchange. The total number of departures during the same period, by death and removals, was 96.

Amongst these, attention may be called to the following :—

1. A pair of Lettered Aracaris (*Pteroglossus inscriptus*) (probably from Pará), purchased July 7th, new to the Collection.

2. An example of Brazza's Monkey (*Cercopithecus brazzæ*) from French Congoland, purchased on July 17th, being the first specimen received alive of this rare and well-marked species (see P. Z. S. 1893, pp. 255 and 443, pl. xxxiii.).

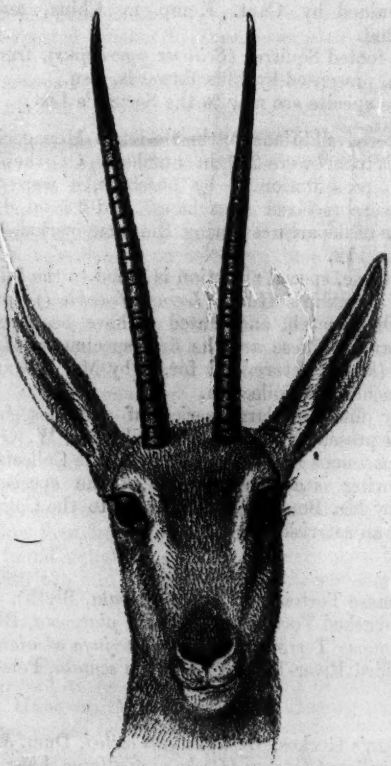
The registered additions to the Society's Menagerie during the month of August were 100; of these 72 were acquired by presentation, 7 by purchase, 13 by birth, 1 by exchange, and 7 were received on deposit. The total number of departures during the same period, by death and removals, was 91.

Among these, attention may be called to the following :—

1. A fine adult female of Loder's Gazelle (*Gazella loderi*), from the Western Desert of Egypt, presented by A. R. Birdwood, Esq.,

[1] See Finn, Proc. A. S. B. 1896, p. 61.

of Cairo, and received August 6th. This species is new to the Collection.



Head of Loder's Gazelle, ♀.

2. Three Ivory Gulls (*Pagophila eburnea*), from Spitzbergen, presented by Mr. J. T. Studley, August 24th. Only one specimen of this Arctic species has been previously received, in 1880 (see P. Z. S. 1880, p. 538).

The registered additions to the Society's Menagerie during the month of September were 125; of these 75 were acquired by presentation, 17 by purchase, 2 by exchange, 13 were bred in the Gardens, and 18 were received on deposit. The total number of departures during the same period, by death and removals, was 88.

Amongst the additions I may invite special attention to the following:—

1. A rare Fruit-Bat (*Pteropus pselaphon*), from the Bonin Islands, obtained by Capt. Kemp in China, and presented September 2nd.

2. A Red-footed Squirrel (*Sciurus pyrrhopus*), from Monravia, West Africa, presented by Ellis Edwards, Esq.

Both these species are new to the Society's List.

The registered additions to the Society's Menagerie during the month of October were 217 in number. Of these 184 were acquired by presentation, 8 by purchase, 4 were born in the Gardens, 9 were received in exchange, and 12 on deposit. The total number of departures during the same period, by death and removals, was 112.

Amongst these, special attention is called to the following:—

1. Three Franklin's Gulls (*Larus franklini*), purchased at Liverpool, October 9th, and stated to have been received from North America. These are the first specimens of this black-headed Gull (kindly determined for us by Mr. Howard Saunders) that have reached the Collection.

2. A very fine and large series of Reptiles from Burma, collected and presented to the Society by Mr. W. G. Bligh, and embracing specimens of 15 species new to the Collection.

The following is a complete list of the species, as kindly determined by Mr. Boulenger, those new to the Collection being marked with an asterisk:—

TESTUDINATA.

11 Burmese Tortoises (*Testudo elongata*, Blyth).
7 Flat-backed Tortoises * (*Testudo platynota*, Blyth).
3 Ceylonese Terrapins * (*Nicoria trijuga edeniana*, Theob.).
4 Shielded River-Turtles * (*Emyda scutata*, Peters).

SAURIA.

5 Cocteau's Geckos (*Hemidactylus coctæi*, Dum. & Bibr.).
12 Verticillated Geckos (*Gecko verticillatus*, Laur.).
6 Yellowish Monitors (*Varanus flavescens*, Günth.).
6 Doria's Lizards * (*Mabuia doriæ*, Boul.).
3 Bell's Lizards * (*Liolepis belli*, Gray).
6 Emma's Lizards * (*Calotes emma*, Gray).

OPHIDIA.

1 Hamadryad (*Naia bungarus*, Schleg.).
1 India Cobra (*Naia tripudians*, Merr.).
1 Banded Bungarus * (*Bungarus fasciatus*, Cantor).
11 Green Pit-Vipers * (*Lachesis gramineus*, Shaw).
4 Grass-green Tree-Snakes (*Dryophis prasinus*, Boie).
2 Sharp-snouted Snakes (*Dryophis mycterizans*, Linn.).
2 Ornamented Tree-Snakes (*Chrysopelea ornata*, Shaw).

5 Robed Snakes * (*Tropidonotus stolatus*, Boie).
2 Fishing-Snakes (*Tropidonotus piscator*, Schneid.).
1 Rayed Snake * (*Coluber radiatus*, Schleg.).
1 Condanar Sand-Snake * (*Psammophis condanarus*, Merr.).
2 Well-spotted Snakes * (*Dipsadomorphus multimaculatus*, Boie).
2 Olivaceous Water-Snakes* (*Hypsirhina enhydris*,Schneid.).
1 Aulic Snake * (*Lycodon aulicus*, Linn.).

In reference to this collection I have received the following notes from Mr. Bligh :—"These reptiles were all obtained in the Minbu and Mague districts of Upper Burma. I held the post of Executive Engineer P. W. D. of the Minbu district, and obtained them by offering rewards to Burman villagers. After a few cash-payments had been made 'on delivery,' these people became very keen in hunting in the jungle for specimens. I had even house-spiders and earthworms brought by small children. Of course, the general impression was that the 'Thakin' was decidedly demented, but at present was harmless. The Burman villagers have a great deal to do in the neighbouring woods, and consequently have a good knowledge of animals. The Land-Tortoises were principally obtained in the low-wooded hilly country near Taungdwingyi, Mague district, and were hunted down by dogs, which bayed on finding the quarry. The Snakes and Lizards were generally noosed with horsehair nooses at the end of a long bamboo. The natives were a great deal more afraid of the Verticillated Geckos than any others. One or two men in a village could always be found equal to capturing the Snakes by depressing the head with the end of a stick or fork, and seizing it by the neck."

Mr. Sclater gave an account of some of the more interesting animals observed in the Zoological Gardens of Antwerp, Cologne, Düsseldorf, Hanover, Amsterdam, The Hague, and Rotterdam, which he had visited in June last.

In Antwerp, under the kind guidance of M. L'Hoest, he had examined the first living example he had ever met with of the very beautiful African Monkey, *Cercopithecus brazzæ* (see P. Z. S. 1893, p. 443, pl. xxxiii.), from the Congo. This species somewhat resembles *C. diana* in its long white beard and white haunch-stripes, but had in life a pale blue nose, besides its conspicuous red front. Other mammals noticed at Antwerp were a pair of Mountain Zebras (*Equus zebra*); a true Burchell's Zebra (*E. burchelli typicus*) without any markings on the legs; a pair of Sea-lions (*Otaria californiana*), with a young one lately born; and a pair of the smaller Buffalo of Western Africa (*Bubalus pumilus*). The pair of Hippopotamuses had now bred eight years in succession, and reared their young one in nearly every case. Among the birds noticed was a hen Westermann's Cassowary (*Casuarius westermanni*) in fine plumage.

In the well-ordered Gardens at Cologne (under the care of Dr. Wunderlich), Mr. Sclater had observed a fine pair of *Phacochœrus œliani* from Somaliland, five examples of *Cervus davidianus* (an adult male, two adult females, and two young males), examples of a small but very pretty Kangaroo (*Onychogalea frenata*), which he had not previously seen alive, and a specimen of *Bassaris astuta* from Mexico. A family of five Sea-lions (*Otaria californiana*) lived together in perfect harmony along with several Cormorants. Amongst the birds at Cologne had been noticed an example of *Haliaetus branickii*, received in 1893, in which the base of the black tail was just beginning to show white feathers, as in the specimen in the Society's Gardens[1]; also specimens of *Gyps bengalensis* and *Cathartes urubitinga*, a pair of *Cygnus americanus*, and an example of a rare S. American Heron, *Ardea leucogastra*.

At the smaller but well-kept Zoological Garden of Düsseldorf (managed by Herr Inspector Goffart) there was a very fine and large adult male specimen of *Cercocebus albigena*, with the long hairs on the neck and shoulders much developed. This animal had been obtained at Caio on the R. Luemme north of the Congo, and presented by Herr Robert Visser eight years ago. There was also in the Monkey-house a fine series of Mandrills (*Papio maimon*) of various ages. A male *Ovis musimon* had bred freely with some ewes of the domestic Sheep (*Heide-schaf*), and had produced many hybrids which were said to be perfectly fertile *inter se*. There was also in this Garden a large flock of *Ovis tragelaphus*—some 25 in number—of both sexes and all ages kept together.

In the Zoological Garden of Hanover (Herr Schäff, Director) were two examples of the *Conurus* which Mr. Sclater had described (P. Z. S. 1886, p. 539, pl. lvi.) as *C. rubritorquis*. Count Salvadori (Cat. Birds, xx. p. 190) had united this species to the Mexican *C. holochlorus*, but Messrs. Salvin and Godman had recently received examples of it from Nicaragua, and were of opinion that it was a valid species. There was a fine adult female Hippopotamus in this Garden—an imported specimen.

The Garden of the Royal Zoological Society, "Natura Artis Magistra," at Amsterdam (Director, Dr. Kerbert), always contained a large and well-ordered series of animals. Upon this occasion the following had attracted Mr. Sclater's special attention:—a young male of the South-American Marsh-Deer (*Cariacus paludosus*); a young female Sumatran Rhinoceros from Borneo (*Rhinoceros sumatrensis*); a well-marked example of the Side-striped Jackal (*Canis lateralis*, Scl. P. Z. S. 1870, p. 279, pl. xxxiii.); a Corsac Fox (*C. corsac*); and a fine adult female specimen of the Mountain-Antelope of Sumatra (*Capricornis sumatrensis*). The

[1] Mr. Sclater took this opportunity of exhibiting a drawing of the specimen of Branicki's Eagle (*Haliaetus branickii*) living in the Society's Gardens, taken by Mr. Smit in July 1896 (Plate XXXVII.). This bird had been acquired by purchase from the Zoological Garden of Hamburg on Sept. 21, 1893 (see P. Z. S. 1893, p. 613).

J.Smit del.et lith.

HALIÆTUS BRANICKII.

Mintern Bros. imp.

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last-named animal he had never previously seen alive. It was generally black, with a white line at the angle of the mouth and slight white tips to the ears; nearly 3 feet in height at the shoulders. The curious long-haired, divaricated mane was slightly mixed with whitish hairs. There were also an adult pair of *Cobus ellipsiprymnus*, and two pairs of *C. unctuosus*, with a young one born in the Gardens. The Giraffe-house was unfortunately vacant.

At The Hague Garden, Mr. Sclater had found little of interest except an example of *Canis adustus*, Sund., from South Africa. He doubted whether Dr. Mivart was correct in referring *C. lateralis*, Scl., of the Gaboon district, to the same species.

At Rotterdam (Heer Van Bemmelen, Director) Mr. Sclater found a fine new Lion-house, a new set of Offices, and other buildings erected since his last visit. The beautiful specimen of *Cephalophus sylvicultrix* which had been figured in the 'Book of Antelopes' (plate xii.) was still alive and in excellent condition. Mr. Sclater had also noticed a pair of Anoas (*Bos depressicornis*) and a young male *Canis jubatus*. The Heronry of Wild Herons in the Garden had this year contained 58 nests.

Mr. P. Chalmers Mitchell, F.Z.S., made some remarks on a supposed case of Telegony, as shown by a Fox-terrier puppy which possessed Dachshund peculiarities, possibly due to a known earlier fertilization of its mother by a Dachshund. The puppy, which had been bred by Mr. O. H. Latter, F.Z.S., was exhibited.

A discussion followed in which Sir Everett Millais, Mr. B. Tegetmeier, and others took part. The general opinion seemed to be adverse to the theory of Telegony.

Mr. Leonard Hill, M.B., Lecturer on Physiology, London Hospital Medical College, and Grocers' Company Research Scholar, gave the following account of some experiments on supposed cases of the inheritance of acquired characters which he had been carrying on:—

"It has been recorded by Brown-Sequard that after section of the cervical sympathetic nerve in Guinea-pigs, a droop of the upper eyelid is acquired, and that this droop is transmitted to the young.

"This statement, at the request of the late Dr. Romanes, I have put to the test of thorough experimental observation.

"In March 1895 I took six healthy normal Guinea-pigs, and in all divided the cervical sympathetic nerve on the left side. A droop of the upper eyelid was thus established, and this has persisted undiminished up to the present date.

"These Guinea-pigs were allowed to interbreed. In none of their

young born in 1895–96 was a persistent droop of the eyelid observable.

"In April 1896 I took twelve of the young and divided the cervical sympathetic nerve in these, and in all on the left side.

"The droop of the eyelid was thus again experimentally established in these twelve, and they were allowed to interbreed.

"In their young, born in the summer and autumn of 1896, no persistent droop of the left eyelid has been observable.

"My original stock of six Guinea-pigs has multiplied to over sixty, and the experiment has proved absolutely negative.

"I am able to exhibit to the Society one member of the original stock, two members of the first generation, and four members of the second generation. In the first three the droop of the eyelid experimentally induced is perfectly obvious, and in the last four no such droop is apparent. It remains for me to suggest a possible source of error in Brown-Sequard's observations.

"Just a day or two before Dr. Romanes's death two Guinea-pigs were born, in both of which a partial closure of the left eye was observable, that is to say on the same side as the lesion in the parents. Unfortunately these Guinea-pigs lived only a few days. This case I briefly reported in the columns of 'Nature' after the death of Dr. Romanes.

"Since then I have seen many young Guinea-pigs which have exhibited a partial closure of the eye for some time after birth. This phenomenon is entirely due to conjunctivitis, and is in no sense hereditary; for the right eye and the left eye are equally often affected. The conjunctivitis occurs when the weather is hottest, and may be so severe as to lead to the destruction of the eye. In cold weather the conjunctivitis and the droop of the eyelid are absent. The droop of the eyelid disappears when the conjunctivitis terminates, and is not therefore persistent. Lastly, I have actually observed the birth of the young guinea-pigs.

"On birth no inequality of the eyes is observable. After birth the new-born lie on the ground, and while the parent licks off the membranes, dirt collects into the eyes from the floor of the cage, and thus the conjunctivitis is established."

Mr. Sclater exhibited (on behalf of the Hon. H. S. Littleton) a coloured life-sized model of the Australian Lung-fish (*Ceratodus forsteri*), prepared by Mr. A. Alder, taxidermist, of Brisbane; and read a letter from Mr. D. O'Connor, of Oxley, Brisbane, offering to supply living specimens of this Fish.

Mr. W. T. Blanford, F.R.S., exhibited, on behalf of Major C. S. Cumberland, four heads of *Ovis ammon* (L.) from the North-west Altai, east of Semipalatinsk, in Central Asia (about lat. 50° N., long. 88° E.). Major Cumberland, during the summer of the present year, had succeeded in shooting seven fine rams, and the horns brought back by him far excelled any belonging to this species that had previously, so far as was known, been seen in this country. Of the largest pair, which had been presented by Major Cumberland to the British Museum, each horn measured 18½ inches in circumference at the base, and 56½ inches in length round the curve; whilst the horns of another pair measured 19¾ inches round the base, though only 54½ long. Evidently this animal exceeded the great Tibetan Sheep, *O. hodgsoni*, in size, and was the largest of all living Sheep.

Head of *Ovis ammon*, from Major Cumberland's specimen in the British Museum.

The heads now exhibited entirely confirmed the view that *O. ammon* must be regarded as a distinct species from *O. hodgsoni*. As had been first pointed out by Sir Victor Brooke and Mr. Basil Brooke, in the 'Proceedings' of the Society for 1875, pp. 518–520, the horns in *O. ammon* were thicker and longer and curved much more outwards towards the ends, and were thus intermediate in curve between *O. hodgsoni* and the form of *O. poli* called *O. karelini* by Severtzoff. *O. ammon*, moreover, wanted the ruff or lengthened hair on the sides and lower surface of the neck that is found, apparently at all seasons, in adult rams of *O. hodgsoni*.

The rams shot by Major Cumberland in summer were very pale-

coloured. They inhabited undulating plateaus at an elevation of from 6000 to 10,000 feet above the sea.

The following papers were read:—

1. On the Mammals of Nyasaland: fourth Notice.

By Oldfield Thomas, F.Z.S.

[Received October 28, 1896.]

(Plates XXXVIII. & XXXIX.)

The present paper contains an account of all the mammals which have been received by the British Museum from Nyasaland since the beginning of 1894, and forms a continuation of my three previous papers on the subject[1]. As before, it is to the generosity and scientific spirit of Sir Harry Johnston that we owe most of the specimens referred to, but in addition some other members of the British Administration have been good enough to contribute specimens on their own account, and thus to further the cause of scientific research.

Among these contributors may be specially mentioned the names of Mr. Alfred Sharpe, Dr. Percy Rendall, and Mr. H. C. McDonald, each of whom has been lucky enough to send home specimens sufficiently distinct to be described as new.

In the following pages, where the name of the collector is put in brackets the specimens have been obtained as part of his official duties in the administration, and are to be considered as presented by Sir Harry Johnston; while direct donations to the Museum are shown by the words "Presented by" before the name of the collector. As usual, the majority of Sir Harry Johnston's specimens have been obtained by that indefatigable naturalist, Mr. Alexander Whyte.

In order to make the list of Nyasa mammals as complete as possible, I have here inserted the name of every species obtained during the whole of Sir H. Johnston's explorations of Nyasaland, with references to the places in the previous three papers where the species are noticed or described, and, in addition, those mentioned by Mr. Sclater in his various papers. As a result the present paper contains a complete list of all the mammals as yet received by the Museum from Nyasaland, numbering 82 in all.

1. Colobus palliatus, Pet.

(*C. angolensis*, Scl. P. Z. S. 1892, p. 97.)

The receipt of more perfect Angolan specimens than were formerly available shows that Peters's species is, after all, distinct, by the presence of a white frontal band, from that described by Sclater.

[1] P. Z. S. 1892, p. 546; 1893, p. 500; and 1894, p. 136.

J.Smit del.et lith.

Mintern Bros. imp.

PAPIO PRUINOSUS.

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J. Smit del. et lith.

Mintern Bros. imp.

RAPHICEROS SHARPEI.

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2. CERCOPITHECUS LEUCAMPYX, Fisch.

(*C. pluto*, Scl. P. Z. S. 1892, p. 97; *C. leucampyx*, Scl. P. Z. S. 1893, p. 253.)

3. CERCOPITHECUS MOLONEYI, Scl.

(Scl. P. Z. S. 1893, p. 252.)

4. CERCOPITHECUS ALBIGULARIS, Sykes.

(P. Z. S. 1894[1], p. 137.)

Three specimens from the Chiradzulu Mts., July 1895 (*A. Whyte*).

5. PAPIO PRUINOSUS, sp. n. (Plate XXXVIII.)

a. Ad. skin, ♂. Fort Johnston, July 24, 1895 (*Dr. P. Rendall*). "Irides yellowish brown. Native name 'Nyani.'"—*P. R.*

Size and length of fur very much as in *P. thoth*, Og., to which the species seems to be most nearly allied, but the hairs are softer to the touch, entirely different in colour, and unannulated throughout. General colour hoary grey, not very unlike that of such specimens of *Didelphys marsupialis* as have white-tipped bristle-hairs. Throughout, on the upper surface, there are two sorts of hairs, the shorter about 3–4 inches in length, and the longer about 7 inches; both have black tips about ¾ to 1 inch long, while their remainder is dirty white. In a general view the black tips of the shorter hairs show clearly against their white bases, but those of the longer hairs do not show at all, so that these latter look wholly white. The general hoary colour obtained by this mixture of black and white extends all over the upper surface, including the head, along the outer sides of the limbs to the metapodials, and to the end of the tail, which is, however, rather blacker proximally and whiter terminally than the rest of the body. Tip of tail untufted. Below, on cheeks, chin, and belly, and on the inner sides of the limbs the black tips disappear, the fur is then entirely dirty white. The fingers and toes are also nearly unmixed white.

Skull very closely resembling that of *P. thoth* in size and general characters, but the muzzle is very decidedly shorter. Thus, while the distance from the orbit to the occiput is almost identical in the two, that from the orbit to the gnathion is very materially shorter in the new form. The muzzle is also more tapering and less parallel-sided anteriorly. The nasals are less flattened, and are more clearly visible in a lateral view of the skull. Below, the palate is shorter, the tooth-rows are more bowed in anteriorly, and the pterygoid fossæ are broader.

In the lower jaw the pit below $\overline{p.^3}$ & $\overline{m.^1}$ is very much shallower, indeed scarcely noticeable, and the chin is much more developed, probably because of the shortening of the palate and consequent vertical position of the lower incisors and canines.

[1] These references refer to the three previous papers in the P. Z. S., in 1892, 1893, and 1894.

Dimensions. ♂, in skin (merely approximate). Head and body 750 mm.; tail 550; hind foot 190.[1]

Skull. Greatest length 182, basal length 131; zygomatic breadth 103·5; gnathion to lower edge of orbit 92; occiput to lower edge of orbit 109; nasals, length mesially 62, greatest breadth 15·2; height of orbit 26; breadth across orbits, outside, at fronto-malar sutures 71; nasion to occiput 110; nasion to basion 81; palate, length 81, breadth between outer sides of $\underline{m.}^2$ 51·3, between inner sides of $\underline{m.}^2$ 30; combined lengths of upper true molars 34·5.

Type. B.M. No. 95.12.7.8.

This remarkable Baboon is distinguished at the first glance from every other species by its hoary colour, white belly, and unannulated fur. It is much to be hoped that further examples of it will be sent home, and also skulls of different ages and both sexes, as Baboons are animals of which our knowledge is miserably imperfect, mainly owing to the fact that nearly all the specimens in the different museums have lived in captivity, and are therefore quite unsuitable for scientific examination.

For this reason, Baboons from all localities, even of the commonest species, are special desiderata to our National Museum, and no wild-killed examples can possibly be valueless, if accompanied by their skulls and a record of their exact locality. Skulls alone, old or young, male or female, to any number, will also be extremely acceptable.

6. Otogale kirki, Gray.

(P. Z. S. 1893, p. 501; 1894, p. 137.)

Three skins. Chiradzulu Mts., July 1895.

"From the Terai of the mountains."—*A. Whyte.*

7. Galago moholi, A. Sm.

(P. Z. S. 1894, p. 137.)

8. Epomophorus crypturus, Pet.

(P. Z. S. 1894, p. 157.)

a, *b*. Zomba (*A. Whyte*).

9. Xantharpyia straminea, Geoffr.

Zomba, Jan. 1896 (*A. Whyte*).

10. Rhinolophus hildebrandti, Pet.

(P. Z. S. 1894, p. 138.)

Three specimens. Fort Johnston, April 16 and Dec. 1895 (*Dr. P. Rendall*).

[1] Dr. Rendall gives—tail 570 mm., hind-foot 210, as the measurements in the flesh.

11. Rhinolophus landeri, Mart.

(P. Z. S. 1894, p. 138.)

Fort Johnston, April and Dec. 1895 (*Dr. P. Rendall*).

12. Rhinolophus capensis, Licht.

(P. Z. S. 1894, p. 138.)

13. Hipposiderus caffer, Sund.

(P. Z. S. 1894, p. 138.)

a. In spirit. Fort Johnston, Dec. 1895 (*Dr. P. Rendall*).
b. Skin. Fort Johnston, Dec. 1895. Presented by Dr. Rendall.

14. Nycteris hispida, Schr.

a. In spirit. Fort Johnston, April 25 and 28, 1895 (*Dr. P. Rendall*).
b. Skin. Fort Johnston, Sept. 5, 1895. Presented by Dr. Rendall.

15. Vesperugo (Eptesicus [1]) megalurus, Temm.

(P. Z. S. 1892, p. 548; 1894, p. 138.)

16. Vesperugo (Eptesicus) rendalli, Thos.

3 skins. Upper Shiré R., July 25, 1895. Presented by Dr. Percy Rendall.

"Roosting during the day on the leaves of a doum palm; caught when the tree was felled. Native name 'Chiputi-puti.'" —*P. R.*

This peculiar white-winged Bat was first discovered by Dr. Percy Rendall on the Gambia, and was described by me in 1889. It is a curious coincidence that its second known capture, in so far distant a country as Nyasaland, is due to the very same naturalist who originally discovered it. There appear to be no differences of any importance between the Gambian and Nyasan examples.

17. Vesperugo nanus, Peters.

(P. Z. S. 1892, p. 548; 1894, p. 138.)

a, *b*. Zomba (*A. Whyte*).

18. Scotophilus nigrita, Schr.

♀. Fort Johnston, Dec. 1895 (*Dr. P. Rendall*).

[1] Dr. Harrison Allen (P. Ac. Philad. 1891, p. 466) has shown that the name *Vesperus* is not tenable in Mammalia owing to preoccupation, and has given the group another name—*Adelonycteris*. But from his own synonymies (Bats N. Amer. ed. 1, p. 31, and ed. 2, pp. 112 & 184, 1893) it is quite clear that *Eptesicus*, Raf., dating from 1820, has a valid claim to adoption. Rafinesque's description is fully pertinent if the evident transposition of the words "outside" and "inside" in the description of the upper incisors be allowed for. The typical species, *E. melanops*, is said to have been already "noticed under the head of *Vespertilio phaiops*," and this latter name Dr. Allen places as a synonym of "*Adelonycteris fuscus*." (See also J. A. Allen, Bull. Mus. Harvard Coll. no. 8, p. 208, 1869.)

19. Rhynchocyon cirnei, Pet.

(P. Z. S. 1894, p. 146.)

Chiradzulu Mts., July 1895 (*A. Whyte*).

20. Petrodromus tetradactylus, Pet.

(P. Z. S. 1892, p. 548; 1893, p. 501.)

21 & 22. Crocidura (*Croc.*), spp. incc.

(P. Z. S. 1893, p. 501.)

Ad. ♀. Fort Johnston, Dec. 1895 (*Dr. P. Rendall*).

Head and body 94 mm.; tail 43; hind foot 13·6; ear 10.

23. Felis pardus, L.

(P. Z. S. 1892, p. 547.)

24. Felis serval, Schr.

(P. Z. S. 1894, p. 139.)

25. Felis caffra, Desm.

Zomba (*A. Sharpe*).

26. Hyæna crocuta, Erxl.

(P. Z. S. 1892, p. 548; 1894, p. 139.)

27. Viverra civetta, L.

(Scl. P. Z. S. 1892, p. 97.)

Zomba (*J. McClounie*).

28. Genetta tigrina, Schr.

(Scl. P. Z. S. 1892, p. 97.)

29. Nandinia gerrardi, Thos.

Ann. Mag. N. H. (6) xii. p. 205 (1893).

The type specimen of this species was obtained on the Lower Shiré by Dr. Kirk in 1861. It does not seem to have been met with by recent collectors.

30. Herpestes galera, Erxl.

a. Ad. skin. Fort Songwe, North Nyasa, Dec. 19, 1895 (*J. B. Yule*).

31. Herpestes gracilis, Rüpp.

(P. Z. S. 1893, p. 501.)

Young. Zomba, Dec. 1895 (*A. Whyte*).

32. Herpestes albicauda, G. Cuv.

(Scl. P. Z. S. 1892, p. 97.)

33. Rhynchogale melleri, Gray.

(P. Z. S. 1894, p. 139.)

Young. Zomba, Feb. 1894 (*A. Whyte*).

34. Crossarchus fasciatus, Desm.

(P. Z. S. 1893, p. 501; 1894, p. 140.)

35. Canis lateralis, Scl.

(P. Z. S. 1894, p. 146.)

Zomba, Feb. 1894 (*A. Whyte*).

Two living specimens of this Jackal were sent to the Zoological Society of London by Sir Harry Johnston from Zomba in October 1896.

36. Poecilogale albinucha, Gray.

Zomba plain, Oct. 1893 (*A. Whyte*).

37. Lutra maculicollis, Licht.

(P. Z. S. 1894, p. 140.)

Fort Johnston (*A. Sharpe*).

38. Anomalurus cinereus, Thos.

Ann. Mag. N. H. (6) xv. p. 188.

It is uncertain whether this can properly be termed a Nyasaland species, as the only locality that could be obtained for the type was "Upper Rovuma River, towards Lake Nyasa."

The attention of Nyasa naturalists is particularly drawn to the question of the occurrence of Flying Squirrels there, as if any are present specimens are sure to be of special interest.

39. Sciurus mutabilis, Peters.

(P. Z. S. 1892, pp. 97 & 548; 1893, p. 502; 1894, p. 140.)

4 skins. Chiradzulu Mts., July 1895.

1 skin. Zomba.

40. Sciurus palliatus, Pet.

(P. Z. S. 1892, p. 549; 1894, p. 140.)

41. Otomys irroratus, Bts.

(P. Z. S. 1892, p. 549; 1893, p. 502.)

Juv. Zomba, Jan. 1896 (*A. Whyte*).

Juv. Fort Johnston, Dec. 1895 (*Dr. P. Rendall*).

42. Gerbillus afer, Gray.

(P. Z. S. 1892, p. 549; 1893, p. 502.)

43. Cricetomys gambianus, Waterh.

(P. Z. S. 1892, p. 550; 1894, p. 142.)

44. Golunda fallax, Pet.

(P. Z. S. 1892, p. 552; 1893, p. 502.)

45. Arvicanthis dorsalis, A. Sm.

(P. Z. S. 1892, p. 551; 1894, p. 142.)

46. Arvicanthis pumilio, Sparrm.

(P. Z. S. 1892, p. 551.)

47. Mus rattus, L., var.

(P. Z. S. 1892, p. 550; 1893, p. 502.)

48. Mus dolichurus, Smuts.

(P. Z. S. 1892, p. 550; 1893, p. 502; 1894, p. 141.)

Ad. ♀ & 2 young. Fort Johnston, Dec. 1895 (*Dr. P. Rendall*).

49. Mus natalensis, A. Sm.

(P. Z. S. 1892, p. 550; 1893, p. 502.)

50. Mus modestus, Wagn. (?).

(P. Z. S. 1892, p. 550; 1893, p. 503 (*Mus musculus*); 1894, p. 141.)

51. Mus (Leggada) minutoides, A. Sm.

(P. Z. S. 1892, p. 550; 1893, p. 503.)

Zomba, Jan. 1896 (*A. Whyte*).

52. Dasymys incomtus, Sund.

(P. Z. S. 1893, p. 502.)

53. Saccostomus campestris, Pet.

(P. Z. S. 1893, p. 503.)

54. Acomys spinosissimus, Peters (?).

Juv. Fort Johnston, Dec. 1895 (*Dr. P. Rendall*).

Too young for exact determination.

This is the first recorded occurrence of the genus *Acomys* in Nyasaland proper, but Peters's specimens came from Bino and Tette on the Zambesi.

It is much to be hoped that further specimens of this Spiny Mouse will be obtained, so that its proper name may be made out with certainty.

55. Dendromys mesomelas, Bts.

(P. Z. S. 1892, p. 252; 1893, p. 503.)

56. Steatomys pratensis, Pet.

(P. Z. S. 1893, p. 503.)

57. Lophuromys aquilus, True.

a. Ad. ♀. Zomba, Jan. 1896 (*A. Whyte*).
b. Imm. Fort Johnston, Dec. 1895 (*Dr. P. Rendall*).
a. Head and body 120 mm.; hind foot 21·5; ear 16.

The determination of this *Lophuromys* is not quite certain, and better series both from East Africa and Nyasa will be required before its identity can be definitely settled. For the information of collectors on the spot it may be mentioned that *Lophuromys* may be readily distinguished from any other rat by its peculiar speckled chocolate colour and its curious harsh and flattened (but not spiny) fur.

58. Myoscalops argenteo-cinereus, Pet.

(P. Z. S. 1892, p. 552; 1893, p. 504.)

59. Aulacodus swinderenianus, Temm.

(P. Z. S. 1892, p. 553.)
Zomba Plateau, 4000 ft., Jan. 1894 (*A. Whyte*).
Young. Zomba, Jan. 1896 (*A. Whyte*).

[Hystrix, sp. inc.

No Porcupine has as yet been recorded from Nyasaland, but one is certain to occur there. Specimens are sure to be of interest, and, as with the baboons, any number of skulls would be most acceptable.]

60. Lepus whytei, Thos.

(P. Z. S. 1894, p. 142.)

a. ♀. Kasitu R., Henga, S.W. of Deep Bay, Nyasa, June 21, 1895. Presented by Mr. Richard Crawshay.

I am not as yet prepared to admit definitely the identification of the Nyasa Hare with *Lepus ochropus*, Wagn., as is done by Dr. Matschie, and prefer to use the name which specially belongs to it, until there is better evidence as to the type of *L. ochropus* having been collected far enough north to be the present form.

61. Procavia johnstoni, Thos.

(P. Z. S. 1892, p. 553 (*P. capensis*); 1894, p. 142.)

62. Procavia brucei, Gr.

(P. Z. S. 1894, p. 144.)

63. Rhinoceros bicornis, L.

(P. Z. S. 1894, p. 145.)

64. Potamochœrus larvatus, F. Cuv.

(P. Z. S. 1893, p. 504.)
Zomba and Mpimbi, Dec. 1893 (*A. Whyte*).

65. PHACOCHŒRUS ÆTHIOPICUS, Pall.

(P. Z. S. 1894, p. 145.)

♂ skeleton. Zomba.

66. BUBALIS LICHTENSTEINI, Pet.

(P. Z. S. 1892, p. 553; 1893, p. 504; 1894, p. 145.)

67. CONNOCHÆTES TAURINUS, Burch.

a. Skin and skull. South end of Lake Chilwa. Presented by Mr. H. C. McDonald.

This specimen is the type of the subspecies distinguished by Mr. Sclater as *C. t. johnstoni*[1].

68. CEPHALOPHUS GRIMMI, Linn.

(P. Z. S. 1892, p. 554; 1893, p. 504.)

Zomba (*A. Sharpe & A. Whyte*).

69. OREOTRAGUS SALTATOR, Bodd.

(P. Z. S. 1892, p. 533; 1894, p. 145.)

70. OUREBIA HASTATA, Pet.

(P. Z. S. 1893, p. 504; 1894, p. 146 (*Nanotragus scoparius*).)

Lake Shirwa (*A. Whyte*).

71. RAPHICEROS SHARPEI, sp. n. (Plate XXXIX.)

a. Ad. skin: ♂. Southern Angoniland. Presented by Mr. Alfred Sharpe.

A *Raphiceros* with the white markings of the Grysbok, but with the feet of the Steinbok.

Size apparently rather less than in the Steinbok (*R. campestris*). General colour rich glossy fulvous rufous, much brighter than in either of the allied species. Mixed with the fulvous hairs there are, as in *R. melanotis*, a large number of perfectly white ones. Muzzle brown above, darkest in the middle line, but without the common sharply-defined nose-patch. Sides of muzzle dirty whitish; cheeks and sides of neck fawn. Crown with a well-marked crescentic black marking, as in *R. campestris*. Ears large, very thinly haired externally, the hairs mostly white, black along the edges. Colouring of under surface and limbs as in *R. campestris*. Tail short, above rufous mixed with white, like the back; below white.

Horns of the single specimen (of the age of which I have no cranial evidence) conical, straight, little more than an inch long, very thick in proportion to their length, but already commencing to be ringed basally, within an inch from their tip. They are thus, whether young or old, quite unlike those of any other allied antelope, and would alone serve to distinguish the new species.

Dimensions (approximate) of the type, a flat skin:—Length of

[1] *Suprà*, p. 616, pl. xxviii. See also p. 506.

head and body 635 millim.; tail without hairs 25; ear-opening (in wet state) 87 × 60. Horns, length anteriorly 31; basal circumference 39.

Type. B.M. No. 96.10.26.3.

This very beautiful little Antelope forms an interesting connecting link between the Grysbok and the Steinbok, which it has been sometimes thought might be placed in different genera, owing to their difference in hoof-structure. In the latter important respect *R. sharpei* agrees with the Steinbok, having no supplementary hoofs, but in the presence of the white hairs in its coat it resembles the Grysbok, while its horns are equally different from both its allies.

If the type is an adult specimen (and its digital epiphyses are already closed), the horns are shorter in proportion than in any other species of the group, but even if not, their great thickness and conical shape would readily distinguish them from those of any other known species.

Mr. Sharpe is to be congratulated on his discovery of this handsome little species, and will, we may hope, soon send home further specimens of it, accompanied by their skulls.

72. KOBUS ELLIPSIPRYMNUS, Og.

(P. Z. S. 1893, p. 504; 1894, p. 145.)

73. KOBUS VARDONI, Livingst.

(Scl. P. Z. S. 1892, p. 98.)

74. KOBUS SENGANUS, Scl. & Thos.

a. Imm. ♀. Senga Valley, Upper Loangwa R. Presented by Mr. R. Crawshay. *Type* of species.

This interesting animal, the representative in the Senga Valley of *K. vardoni*, from which it differs in its smaller size, is fully described in the 'Book of Antelopes' (ii. p. 145) and only a passing reference to it is here necessary.

75. CERVICAPRA ARUNDINUM, Bodd.

(P. Z. S. 1894, p. 146.)

Lake Mweru (*A. Sharpe*).

The Mweru Reedbuck has a well-marked black patch on the crown between the horns. Similar patches have been noticed by Gray in S. African specimens.

76. ÆPYCEROS MELAMPUS JOHNSTONI, Thos.

(P. Z. S. 1892, p. 553; 1894, p. 145.)

77. HIPPOTRAGUS NIGER, Hart.

(P. Z. S. 1893, p. 504.)

78. OREAS CANNA, H. Sm.

(P. Z. S. 1893, p. 504; 1894, p. 145.)

79. STREPSICEROS KUDU, Gray.
(P. Z. S. 1894, p. 145.)

80. TRAGELAPHUS ANGASI, Angas.
(Scl. P. Z. S. 1892, p. 98.)
Zomba, 1893 (*A. Whyte*).
Mantanns, near Chilomo, Oct. 1894. Presented by Lieut. G. Oliver, R.N.

81. TRAGELAPHUS SCRIPTUS ROUALEYNI, Gord. Cumm.
(P. Z. S. 1893, p. 505; 1894, p. 145.)
Two males. Top of Mount Zomba. Presented by Mr. Alfred Sharpe.
Zomba, Dec. 11, 1893 (*A. Whyte*).

82. MANIS TEMMINCKI, Smuts.
(P. Z. S. 1892, p. 554; 1894, p. 145.)

2. On Collections of Rodents made by Mr. J. ffolliott Darling in Mashunaland and Mr. F. C. Selous in Matabeleland, with short Field-Notes by the Collectors. By W. E. DE WINTON, F.Z.S.

[Received August 31, 1896.]

(Plate XL.)

I. MR. DARLING'S COLLECTION.

By the kindness of the authorities of the British Museum I have been allowed to work out the Rodents contained in the collection of small Mammals made by Mr. Darling during last year, while engaged in mining work in the Mazoe district, about 4000 ft. above sea-level, on the headwaters of the river of the same name which flows N.E. into the Zambesi.

Collections from Africa with reliable data are always looked forward to with much interest, but I think that this one, from a district which of late has been brought so prominently before us, has very special recommendations.

Every specimen has been most carefully prepared, with date of capture, sex, and measurements, taken in the flesh, recorded, and in almost every case the skull accompanies the skin; in the few cases when this is missing, it is fully accounted for by having been eaten by a hen or some evil beast; in one case the skull alone is sent, the skin preserved with arsenical soap and stuffed with cotton wool, having been eaten and vomited by a cat, was thought to be not worth postage, which, by the way, is 2*s.* 9*d.* per lb.

With a further consignment we may hope to receive duplicates

J.Smit del. et lith. Mintern Bros. imp.

I.GEORYCHUS DARLINGI. 2.ACOMYS SELOUSI.

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of all the species in spirit, and also more extensive field-notes, which will add very considerably to the value of the collection. As usual, the small mammals seem to be the last important zoological group to come in; for although of course the larger mammals of this region have been long known, and, alas! many well-nigh exterminated, and the birds and insects have been largely collected, the present is the first collection of smaller mammals of any importance numerically that has reached the museums of Europe.

The collection contains 47 specimens, referable to 16 species, all belonging to the family *Muridæ*, with the exception of one Dormouse and one Rodent Mole.

It seems strange that no Squirrel is represented, more especially as a Galago is included in the collection. Africa south of the Zambesi is curiously weak in Squirrels, only two species of *Sciurus* being found (one of which, *Sc. cepapi*, is peculiar to this region); neither of these can be called plentiful. This may be accounted for by the absence of any large forests, and perhaps, in a minor degree, by the partiality shown by the natives for small Rodents as food; these animals, owing to their diurnal and climbing habits, being more easily found than rats and mice, stand a very poor chance, especially as the trees which they frequent are mainly confined to the banks of rivers or to clumps on low-lying ground where water most likely lies beneath.

The value of this collection can in no way be measured by its numbers or by the excellent condition in which both skins and skulls are found, though these reflect the greatest credit on the collector; for among the 16 species represented there are 7 that are entirely new to science or that if found elsewhere have developed such well-marked characters in this geographically distinct area as to necessitate the giving of a distinguishing subspecific name. One of these, a *Georychus*, was described by Mr. Thomas last year and named in honour of the collector, and is here figured (Plate XL.), the remaining six are described in this paper. At the same time one or two of these are not in any way confined to the Mashunaland plateau, but have simply been confused with other species, and perhaps, from being rather common, have been considered not worth sending home.

1. Myoxus (Eliomys) nanus, sp. n.

Ad. skin. ♂. Mazoe, Mashunaland, 21 July, 1895.

"Lives in trees and roofs of huts. Native name 'Sindewara.'"—*J. ff. D.*

Collector's measurements, taken in the flesh, of type 95.8.27.4 in Brit. Mus.:—Head and body 86 mm.; tail 72; hind foot 15; ear 14.

Skull: length 24; breadth 13; depth, top of parietal to base of bulla 9·5; breadth of cranium 11; narrowest intorb. 4; nasals 9×3; basal length 20·5; henselion to back of palate 8; palate to foramen mag. 10·5; molar series 3; diastema 5; mandible, depth at coronoid 6·3; tips of incisors to condyle 14·5.

Size much less than *M. murinus*. Colour above uniform grey, the only marking being a black patch commencing among the whiskers and extending to the eye, and continuing on to the eyebrows; the eyelids are black; the upper lips and cheeks white, this colour reaching to immediately beneath the eyes and ears; all the underparts are white; the under-fur above and below dark slate-colour; the hands and feet very small and slender, of not so pure a white as the belly; ears rather large, naked; tail subcylindrical, bicoloured, grey drab above and dirty white beneath, the hairs short near the base, very gradually lengthening till at the extremity they are 13 mm. in length; the light hairs of the underside exceed those of the upperside in length and so form a pale margin.

The much larger ears and less bushy tail distinguish this species at a glance from *M. smithi*, Thos., besides the black marks on the cheeks and the greyer colour. As the tips of the hairs in this species are pale and colourless, and only the upper part of the tail shows any drab, it must be quite distinct from *E. kelleni*, Reuvens, as also for the same reason from *E. parvus*, True, with the addition that the under-fur of the cheeks and throat is dark slate-colour and not white. The ears are certainly not small for a Dormouse and there is no hair on them which is perceptible to the naked eye, so there is no colour on the borders which both these species are described as having. I may say that the measurement of the ear is taken from the notch, as in all specimens in this collection.

Mr. Darling writes:—"I have been telling them (the natives) to get me some more dormice, but they say all those animals are gone away: I know they are scarce, but I may be able to get some. One hut I had on a bushy hill, a little chap used to live inside, and come down quite close and watch me reading as I lay in bed at night; if they eat insects he may possibly have come to catch them at the candle, but I never saw him do so."

2. GERBILLUS AFER, Gray.

Eight specimens of both sexes and of various ages taken at Mazoe, Mashunaland, between the months of April and September, 1895.

"Fairly common. Native name 'Bendy.'"—*J. ff. D.*

Collector's measurements taken in the flesh, adult ♂:—Head and body 155 mm.; tail 166; hind foot 32; ear 20.

This is a nice series, showing the various forms of colour from grey to foxy red. The bright colour on the cheeks and along the whole length of the body immediately above the white of the underparts makes its appearance at a very early age, but may not reach the dorsal region till long after the animal is full-grown and the teeth worn so as to show the complete pattern of the enamel of the first molars, and the animal has reared young ones; thus it seems probable that many never assume the red colouring at all, as there are specimens almost black on the back with well-

worn teeth, while others almost red-fawn have their teeth very much less worn. In fact from this series it is impossible to say whether age, sex, or season has much to do with the varying colour, though there is little doubt that the immature animals are invariably dark grey, showing the red first on the cheeks and along the sides. The tail varies in length, but is generally somewhat longer than the head and body.

3. Otomys irroratus, Brts.

α. Ad. sk. ♂. Mazoe, Mashunaland, 8 January, 1895.
β. Ad. sk. ♂. „ „ 4 August, „
γ. Ad. sk. ♂. „ „ 5 „ „

Collector's measurements, taken in the flesh, of α:—Head and body 197 mm.; tail 117; hind foot 28; ear 22.

"Common in marshes. Native name 'Nappy.'"—*J. ff. D.*

These specimens all agree with the Cape form in the general gold and dark brown grizzled colour.

. Mus chrysophilus, sp. n.

Ad. sk. ♀. Mazoe, Mashunaland, 14 August, 1895 (type).
„ ♂. „ „ 14 „ „
„ ♂. „ „ 15 „ „
„ ♂. „ „ 19 „ „
„ ♂. „ „ 17 January, „
„ ♂ imm. Mazoe, Mashunaland, 16 January, 1895.

"Trapped in grass. Native name 'Mãché.'"—*J. ff. D.*

Collector's measurements, taken in the flesh, of type 95.11.3.23 in Brit. Mus.:—Head and body 146 mm.; tail 168; hind foot 28; ear 19.

Skull: greatest length 38 mm.; breadth 18; breadth of brain-case 15; nasals 14·5×4·5; frontals 12; parietals 6·8; inter-parietals 4×9·5; basal length 32; henselion to back of palate 16; palate to foramen mag. 12·5; incisive foramina 9×2·5. Upper molar series 6; diastema 9·5; depth, parietals to bulla 12; mandible, height at coronoid 11; incisor-tips to condyle 24.

The whole of the upper parts bright reddish-fawn, strongly sprinkled with black hairs; cheeks and sides and thighs rather paler, the dark hairs being less numerous and of a browner tint; the whole of the underparts, including the feet and hands, almost pure white; the colours of the upper and under sides being clearly defined. *All the hairs above and below dark slate-colour basally.* Ears moderate and naked, save for a few scattered rufous hairs. Tail almost naked, but with a few very short adpressed hairs, which increase in number and length towards the tip; scales in rings 10 to 10 mm., shining like mica in some lights, the basal half is indistinctly bicoloured, brown above, whitish beneath, the terminal portion unicoloured brown.

Allied to *M. kaiseri*, Noack, but very distinct in colour.

This handsome Rat is not confined to the Mashunaland plateau,

as the Museum has lately received specimens from the Transvaal collected by Dr. Percy Rendall, and it is possible that its range may extend still further south, as from the very little attention the small mammals have received since the time of the early discoverers, and owing to the bad state of preservation of many of the original types, this species has been overlooked.

5. Mus auricomis, sp. n.

a. Ad. sk. ♂. Mazoe, Mashunaland, 9 August, 1895.
β. Ad. sk. ♂. „ „ 19 „ „ (type).
γ. Ad. sk. ♀. „ „ 19 „ „

"Testes larger than those of the larger species" (*M. chrysophilus*).—*J. ff. D.*

Collector's measurements, taken in the flesh, of type 95.11.3.21 in Brit. Mus.:—Head and body 113 mm.; tail 147; hind foot 24; ear 17.

Skull: greatest length 31; breadth 15; across brain-case 13·5; nasals 13 × 4; frontals 9·5; parietals 5; interparietals 4 × 9; basal length 26·5; henselion to back of palate 13·5; palate to foramen mag. 10; incisor foramina 7·5; upper molar series 5·2; diastema 7·5; depth, parietals to bullæ 11·1; mandible, height at coronoid 8·5; incisor-tips to condyle 20.

The whole of the upper parts yellow-fawn, strongly sprinkled with black hairs; cheeks and sides and thighs almost pure fawn, showing considerable contrast to the darker dorsal region; the whole of the underparts, including the feet and hands, almost pure white; the colours of the upper and under parts being clearly defined. The bases of the hairs of the back slate-colour (paler than in *M. chrysophilus*), those of the underparts being pale grey only at the extreme bases. Ears moderate and naked, save for a few yellow hairs. Tail almost naked, but with a few very short adpressed hairs, which increase in number and length towards the tip; scales in rings 11 to 10 mm., shining like mica in some lights, the basal half is indistinctly bicoloured, brown above, whitish beneath, the terminal portion unicoloured brown.

Closely resembling *M. chrysophilus* in general characters, but distinctly smaller; the colour is less rufous and more golden, with more contrast between the colours of the back and sides, and whereas the under-fur of *M. chrysophilus* is dark slate above and beneath, in this species it is grey-slate above and the underparts have this colour only at the bases of the hairs, or the hairs may be white throughout.

This Rat no doubt is closely allied to *Mus namaquensis*, A. Smith, described in the S. Afr. Quart. Journ. vol. ii. p. 160 as *Gerbillus namaquensis*; it is distinguished, however, by its shorter ears and longer tail; the fur does not seem so soft, and is shorter. From *M. pœdulcus*, Sund., it is distinguished by the coarser scales on the tail and the cusps of the molars are set in straighter cross rows, the teeth broader.

6. Mus rattus, Linn.

α. Ad. sk. ♀. Mazoe, Mashunaland, 18 May, 1895.
β. Im. sk. ♂. „ „ 18 January, 1895.
"Taken in the house, very common. Native name 'Gonzo.'"—*J. ff. D.*

Collector's measurements, taken in the flesh, of α:—Head and body 188 mm.; tail 220; hind foot 34; ear 25.

I cannot separate these two specimens from the brown form of *M. rattus*. It is the common House-Rat of the district.

7–9. Mures, spp.

There are three Mice in the collection belonging certainly to two and possibly to three distinct species, which at present I will not venture to determine. The two larger ones, male and female, differ markedly in colour, one being nearly black and the other brown, but they agree fairly in the skulls and dentition as well as can be judged, allowing for the great difference of age which exists between them; they belong no doubt to Mr. Thomas's group which he has so well named "multimammate." The third, a male, may possibly be *M. mariquensis*, A. Smith, and belong to the group which has 3—2=10 mammæ; but until further specimens are obtained I would rather not assign any particular name to it.

10. Arvicanthis dorsalis, A. Smith.

α. Ad. sk. ♂. Mazoe, Mashunaland, 30 January, 1895.
β. Ad. sk. ♀. „ „ 13 „ „
γ. Juv. sk. ♂. „ „ 13 August, 1895.
"Trapped in grass; not uncommon. Native name 'Chewangaranga.'"—*J. ff. D.*

Collector's measurements, taken in the flesh, of α:—Head and body 130 mm.; tail 134; hind foot 28; ear 17.

This species seems very constant in colour throughout its extensive range, and there is little difference between the old and young, the latter being generally more rufous, the inner side of the ears more thickly clothed with short reddish hairs, and the tail more thickly covered with hair so as to almost hide the scales. The clearly-defined narrow black dorsal stripe seems never to vary. The fifth finger is so small that unless examined closely there appear to be only three toes on each of the feet; this character is shared by *A. barbarus*, L., and *A. pulchellus*, Gr.

11. Arvicanthis pumilio dilectus, subsp. n.

α. Ad. sk. ♂. Mazoe, Mashunaland, 2 August, 1895 (type).
β. Sen. sk. ♂. „ „ 5 „ „
γ. Ad. sk. ♂. „ „ 1 „ „
"Not uncommon. Native name 'Shanchey.'"—*J. ff. D.*

Collector's measurements, in flesh, of type 95.11.3.25 in Brit. Mus.:—Head and body 106 mm.; tail 82; hind foot 20; ear 14.

Skull: greatest length 27; breadth 14; basal length 23·5; henselion to back of palate 11·5; palate to foramen mag. 10;

length of upper molar series 4·8; diastema 7; mandible, height at coronoid 9; tips of incisors to condyle 18.

Dorsal stripes arranged as in *A. pumilio*, Sparrm., but all the stripes more clearly defined; the general colour darker and more dusky above and below. A dark stripe commences between the eyes; immediately behind the ears it widens out and branches into two stripes, which join again just above the base of the tail; the median space from the neck to near the tail is more rufous than the body-colour; outside the two dorsal black stripes, from the neck to the rump, are two pale buff stripes, and outside these again two black stripes commencing at the back of the ears and running to the base of the tail; all the stripes are subequal in width; outside these stripes the fur is a dark rich mixture of red-brown and black, the colour gradually fading to the paler underside, which is dusky, strongly washed with orange; the feet share the general much darker grizzled colour as compared with *A. pumilio typicus*.

By the measurements it will be seen that this species is considerably smaller than its Cape ally, and of about the same size as the brightly-coloured *A. pumilio diminutus*, Thos., of British E. Africa.

12. Dasymys incomtus fuscus, subsp. n.

α. Sen. sk. ♀. Mazoe, Mashunaland, 4 August, 1895.
β. Ad. sk. ♂. „ „ 1 „ „
γ. Ad. sk. ♂. „ „ 2 „ „ (type).

"Native name 'Garu.'"—*J. ff. D.*

Collector's measurements, taken in the flesh, of type 95.11.3.14 in Brit. Mus.:—Head and body 157 mm.; tail 146; hind foot 32; ear 21.

Skull: greatest length 37 mm.; breadth 20·2; basal length 35; henselion to back of palate 20; palate to foramen mag. 13; length of upper molar series 7·3; diastema 12·2; mandible, height at coronoid 14; incisor-tips to condyle 27.

Size and general characters as in the type species, but differing in colour, being of a uniform sooty black, only slightly grizzled with yellow. Upper incisors deep red-orange; lower incisors brownish honey-colour.

There is considerable difference in the ages of these three specimens, the female being evidently very old, but all agree most perfectly in colour, and there can be no doubt this is a well-marked geographical race and must be distinguished by name.

13. Golunda fallax, Pet.

Skull only received.

"♂. Mazoe, Mashunaland."—*J. ff. D.*

14. Saccostomus mashonæ, sp. n.

α. Ad. sk. ♂. Mazoe, Mashunaland, 13 June, 1895 (type).
β. Ad. sk. ♂. „ „ 5 May, 1895.
γ. Ad. sk. ♀. „ „ 19 „ „

"Pouch-Rat. Native name 'Sūgū.'"—*J. ff. D.*

Collector's measurements, taken in the flesh, of type 95.8.27.10 in Brit. Mus.:—Head and body 135 mm.; tail 35; ear 18; hind foot (taken from dried skin) 22.

Skull: greatest length 35·5; breadth 17·3; basal length 31·5; henselion to back of palate 18; palate to foramen mag. 11; length of upper molar series 5; incisive foramina 7; diastema 11; mandible, height at coronoid 12; tips of incisors to condyle 24.

Colour above dark iron-grey, formed by a mixture of grey-drab and black, the sides and thighs with much less black intermixed; on the cheeks and along the lower margin of the dark colouring of the upper parts there is a strong tinge of drab, which includes the upper lips and the forearms, before passing into the cream-white of the underparts, but posteriorly the light colouring passes along the inner side of the thighs and only the feet are whitish. All the hairs of the underparts are slate-grey for the greater part of their length, finely tipped or ringed with grey-drab; those on the head and back have long black tips, and there appear to be many very fine entirely black hairs intermixed, but owing to the extreme softness of the fur it is very difficult to give a precise description; the general effect is drab-grey, strongly washed with shining black. One specimen, a very old male, does not show quite so much black on the back, and is rather more washed with drab; but the third, an adult female, agrees most perfectly with the type in colouring.

The animal under notice is a much larger species than *S. campestris*, Pet., but, besides the size, the dark grey colour at once distinguishes it from its congeners.

The skull does not show any marked peculiarity that would not naturally be looked for in a larger animal; but $\frac{m.2}{}$ has a small though well-developed extra outer anterior cusp, the position being occupied by a mere ledge in *S. campestris*.

Tail rather thinly covered with hair, intermixed are longer very fine hairs which stand out, recalling the tail of a *Crocidura*; in old animals the tail becomes nearly naked.

15. STEATOMYS PRATENSIS, Pet.

α. Ad. sk. ♂. Mazoe, Mashunaland, 19 August, 1895.
β. Ad. sk. ♂. „ „ 19 „ „

"Very fat, not common. Native name 'Shāna.'"—*J. ff. D.*

Collector's measurements, taken in the flesh, of α:—Head and body 96 mm.; tail 45; hind foot 17; ear 16.

General colour dull drab-brown, underparts white, feet dirty white. The measurement of the ear would seem large enough for Dr. Peters's *S. krebsi*, but the colour agrees with the species to which I have referred it, and indeed the second specimen has a considerably shorter ear.

16. GEORYCHUS DARLINGI, Thos. (Plate XL. fig. 1.)

α. Ad. sk. ♂. Mazoe, Mashunaland, 11 March, 1895.
β. Imm. sk. ♂. „ „ 1 „ „

γ. Juv. sk. ♂. Mazoe, Mashunaland, 20 August, 1895.
δ. Ad. sk. ♂. „ „ 5 September, 1895.
ε. Ad. sk. ♂. „ „ 7 „ „
ζ. Ad. sk. ♀. „ „ 7 „ „

Collector's measurements, taken in the flesh, of *a*:—Head and body 125 mm.; tail 9; hind foot 19.

"Common. Native name 'Nōta.'"—*J. ff. D.*

This Rodent was described by Mr. Oldfield Thomas in the Ann. & Mag. Nat. Hist. ser. 6, vol. xvi. 1895, p. 239; it is distinguished by the clearly-defined triangular pure white spot on the top of the head. The young appear to be mouse-grey and much darker than the drab-coloured adult.

II. Mr. Selous's Collection.

Since writing the account of Mr. Darling's collection, the following Rodents, collected and presented to the British Museum by Mr. F. C. Selous, have been received. The collection, containing nearly fifty specimens, was made at Essex Vale, about 4500 feet above sea-level, near Buluwayo in Matabeleland, between the months of August and October 1895, and should have reached the Museum in the beginning of this year, but, owing to the disturbances in the lands of the South African Chartered Company, the case containing it was detained at Mafeking for more than six months.

Besides additional examples of the two new species of *Mus* described above in Mr. Darling's collection, there are specimens of two undescribed species—an *Acomys*, which I have great pleasure in naming in honour of the collector, and a *Georychus*, named in honour of the "mighty hunter"; the latter animal is of particular interest, as it clearly shows the geographical distinction in the fauna of these two adjoining districts.

Mr. Selous had the advantage of the services of Mr. J. Notman in collecting and preserving these specimens; the skins are all of a uniform pattern, thus facilitating comparison enormously, and the skulls are in the most perfect state. I can safely say that this is the best preserved African collection that has ever been received by the British Museum. We may hope to have the distinguished collector among us before long, as I am glad to say he is now on his way home, after the gallant defence of Buluwayo. A second collection which he had hoped to bring with him was unfortunately burnt by the Matabele at the outset of the rebellion, with the whole of the contents of the pretty homestead of Essex Vale.

1. Gerbillus leucogaster, Pet.

6 skins, 7 skulls: 4 ad. ♂, 2 ad. ♀. Sept. and Oct.

"Trapped by a stream; common."—*F. C. S.*

There can be little doubt that these belong to Prof. Peters's species; unfortunately they are rather young, none of them having the teeth much worn. In contrast to the series of *G. afer* in

Mr. Darling's collection where no two are exactly alike in colouring, these are all absolutely identical, soft grizzled fawn-yellow.

2. Mus rattus, L.

2 skins and skulls, ♂ ♀.

"Trapped in house; very common."—*F. C. S.*

These two agree with those received from Mr. Darling.

3. Mus chrysophilus [1], mihi.

8 skins, 9 skulls: 4 ♂, 3 ♀, 1 not sexed. Aug.–Oct.

"Trapped in rocky kopje, common: but one taken near house; carrot for bait; very common."—*F. C. S.*

These specimens agree in every particular with those described above from Mashunaland, and we may hope that Essex Farm will turn out a gold-mine, as all the specimens yet received have come from gold-bearing districts.

4. Mus auricomis [2], mihi.

3 skins with skulls: 2 ♀, 1 ♂. Sept. and Oct.

"Trapped in Rocky kopje."—*F. C. S.*

Agreeing perfectly with the Mazoe animals described above.

5. Mus, sp.

6 skins with skulls. Sept. and Oct.

"Trapped near house; carrot for bait; common."—*F. C. S.*

These Mice are very uniform in colour, of a more yellow-tinted colour than one of about the same size in Mr. Darling's Mazoe collection, and differing in the shape of the skull, but topotypes of the earlier described species are necessary before we can properly unravel this difficult group. They are of the multimammate group.

6. Mus natalensis (?).

6 skins and skulls: 2 ♀, 4 ♂. Aug.–Oct.

"Trapped in Kaffir garden by a stream; common."—*F. C. S.*

Unfortunately the mammæ are not traceable in either of the females.

7. Acomys selousi, sp. nov. (Plate XL. fig. 2.)

4 skins, 5 skulls: 2 ♀, 1 ♂, 1 not sexed.

"No. 33, Mouse, ♂, Matabeleland; 8 Oct. 1895. Trapped in rocky kopje."—*F. C. S.*

Collector's measurements taken in the flesh:—H. & b. 83 mm.; tl. 92·5; h. f. 16·5; ear 14.

Upper parts smoky rufous-brown or coffee-colour, more smoky on the face and darker on the dorsal region; clear chestnut-brown on the cheeks, sides, and a patch behind each ear. Whole of the

[1] Above, p. 801.
[2] Above, p. 802.

underside including the upper lip and feet, pure white, line sharply defined; ears and tail brown, naked, the latter paler on the underside.

Type, No. 33, ♂, Essex Farm, Matabeleland; 8 Oct., 1895.

General colour much like *Mus sylvaticus*, but with the smoky bloom peculiar to the genus.

Skull, old male:—Greatest length 25·5; br. zyg. 12·5; br. brain-case 11·3; nasals 10·5 × 3; interpar. 3 × 8·5; basal length 21; bk. of ins. to bk. of pal. 12·5; pal. to foram. mag. 7; ins. foram. 5·8; upper molar series 4; outside $\frac{m.1}{}$ 1·6; inside $\frac{m.1}{}$ 3·1; diastema 6·5. Mandible: gr. length (bone) 13·1; to tip of incisors 16.

Near *A. wilsoni*, Thos., but larger.

8. GEORYCHUS NIMRODI, sp. n.

4 skins, 1 ad., 3 juv.; 5 skulls, 2 ad., 3 juv. All taken in Nov.

Size much as in *G. hottentottus*, Less., and *G. darlingi*, Thos.: differing from the former in its drab colouring, and from the latter in the absence of the triangular white patch on the nape. The skull is at once distinguished from its allies by the ascending processes of the premaxillaries not extending backward beyond the nasals, so that the suture between these bones and the frontals forms a simple slightly bowed line, very distinct from the complicated dove-tail pattern found in most of the *Georychi*. The sagittal crest is only faintly developed, the interparietal bone being rounded. The zygomata are not so much bowed out anteriorly as in *G. hottentottus*, and in this it resembles *G. darlingi*, as also in the thickened outer walls to the anteorbital foramina. In the type specimen these foramina are very small, on one side indeed being little more than a pin-hole, but this is a somewhat variable character in this species. From the lachrymal projection the skull recedes abruptly to the narrowest part of the constriction, with no posterior lateral inflation of the frontals in the interorbital region. The postnarial aperture is rather wide, the back of the palate being slightly cut away on either side, leaving a projecting point in the middle line; the posterior opening of the alisphenoid canal is larger than in *G. hottentottus*.

I select as the type a specimen marked by the collector, "No. 46, Mole, ♂, caught 18 Nov., 1895. Head and body 147 mm., hind foot 24·5. Kaffir garden, only appeared on surface since rainy season began. Locality, Essex Farm, Matabeleland."—*F. C. S.*

Measurements of skull of type: basilar length 31; greatest breadth 27.

This new species is unquestionably nearly related to *G. darlingi*, but outwardly as well as craniologically the two forms are easily distinguished.

3. On the Antelopes of the Aures and Eastern Algerian Sahara. By Alfred E. Pease[1].

[Received June 24, 1896.]

In the following notes I shall confine myself to the Antelopes of those regions of Algeria which are comprised between the Aures Range and the borders of the countries inhabited by the Chamba and Touareg tribes of the Sahara. Although much of my time during the years 1892, 1893, 1894, and 1895 was devoted to hunting the Barbary Wild Sheep, I shall consider this, which is in my opinion the most interesting of all the North-African wild animals, outside the scope of this paper. However, in passing, I might be allowed to say that M. Foureau, in the spring of 1895, assured me that he had found this Sheep in great numbers in the mountain-ranges of those districts he had explored in the countries of the Touaregs, and that those he had shot were identical in appearance with specimens of the Atlas and Aures and El Goléa mountains in the south, though he believed they were smaller in size. At the same time he asserted that he had made a discovery so at variance with all preconceived ideas of the habitat of the Red Deer (Arab *Fortassa* or *Mustarb*), and which he regarded as "*une chose si bizarre*," that he almost hesitated, in regard for his own reputation, to make it known. His discovery was this, that he had convinced himself of the existence of *Cervus barbarus* in certain of these districts of the Ahaggar between the marshy jungles and the mountains. The only places that I know of where the Barbary Deer still lingers in N. Africa is to the E. of Tebessa and in the forests to the north of Gafsa in Tunisia, where happily it has been placed under the protection of the French Departments of Forests. The horns that I have seen from these districts lead me to believe that the Tunisian Deer is inferior in point of size to the European Red Deer. The Buffalo is still to be found in the marshes near Biserta, and is also under protection, one native Kaid alone having the right to hunt them.

The Bubal (*Bubalis buselaphus*) is now extinct in the Province of Constantine, and very rare indeed in Tunisia and in Oran. In a journey made in 1895 through the Djereed and into the Tunisian Aures I not only never saw one, but never could obtain any but the most uncertain accounts of where they could be found. If I returned to that country I should search for them in the neighbourhood of Douz and the Dahar district. In 1738, according to Shaw, "these kingdoms" (*i. e.*, the Barbary States, Eastern Province) "afforded large herds of the Neat kind called *Bekker el Wash* by the Arabs. This species," he goes on to say, "is remarkable for having a rounded turn of body, a flatter face, with horns bending more towards each other than the tame kind."

The term *Begra el Ouash* (Wild Cow) is indiscriminately used by the Arabs for both the Bubal and Addax, and travellers should

[1] Communicated by the Secretary.

bear this in mind in making enquiries. The Arabs, however, use the word "*Meha*" exclusively for the Addax, though probably the general run of natives are unacquainted with this name.

The Addax (*Addax naso-maculatus*), called by the French "Antilope du Sud," by the Arabs "*Begra el Ouash*" or "*Meha*," and by the Touaregs "*Tamita*" (or *Tameeta*), has been so often described that I will not attempt any description of it myself, but simply give such information as to its habitat and habits as I have been able to gather whilst travelling in the Sahara and residing at Biskra.

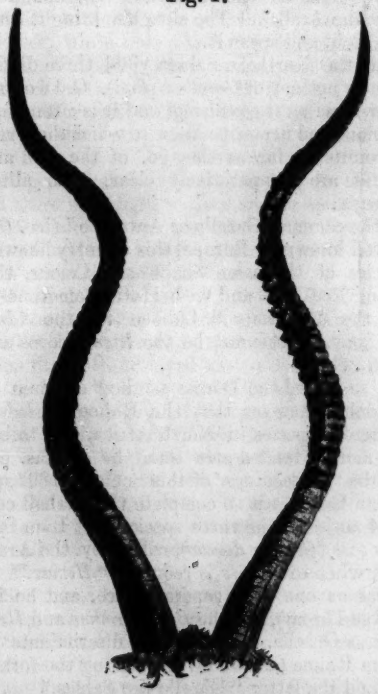
I do not know of any good complete specimen in any museum, nor have I been able to obtain one myself, though, along with Sir Edmund Loder, I made one good bid to reach the confines of those countries where it is to be found in great numbers. In February 1895, furnished with all the information I could obtain from M. Foureau and natives familiar with the Erg, we started from Biskra to reach the country between El Oued Souf and Rhadamis. After a week's journey across the desert by way of the great Chotts we reached the Oued Souf. At El Oued, the last outpost of the French in the direction of Rhadamis, we were stopped till Capitaine de Prandière obtained instructions from the General of Division permitting us to go on. After a detention, made pleasant by the great kindness and hospitality of the three French officers in command of the native garrison, we had the disappointment of being told that we could not be allowed to proceed southwards. At the time we thought this very hard, for though we were aware that the Touaregs had lately raided the Chambas as near as Mey, we felt that a flying visit to the country east of Bir Beresof would be without danger, as we could be in and out again before our presence was discovered. But a few months later M. Foureau and a strong force were driven back from the south, though he had reached a point far beyond our proposed destination, and I think our hosts were entirely justified in their refusal. Our plan had been to reach Bir Beresof, and then to strike east for Bir Aoueen, where we should in all probability have come up with the Addax, which visits this district in large quantities in favourable years. The Addax country is the Erg, the great region of sand-dunes covered more or less thickly with vegetation according to situation and rains. This sand-dune country covers hundreds—it may be said thousands—of miles and the Addax follows the rains. In certain districts it is not uncommon for rain not to fall for several years in succession. In one year the Addax are only found far south of Rhadamis and Aïn Taïba (S. of Ouargla), in other years they follow the rain as far north as the southern borders of the Chott Djereed in the east and the neighbourhood of Aïn Taïba in the west. Without the help of the French and a good escort of Chambas it would be vain to attempt to reach the Rhadamis country by way of Bir Beresof; and the wells being sometimes nine days apart, it is a difficult route to follow.

I heard when at Touzer that a M. Cornex had obtained a

"*Begra el Ouash*" within a few days of Douz; possibly this was the Bubal, though I was assured that he had got the Addax. M. Cornex (a Swiss) had adopted the religion and dress of the Arabs, and had therefore facilities of reaching places and avoiding dangers that were quite exceptional.

In 1894 the Touaregs raided as far north as the southern shores—if they can be called shores—of the Chott Djereed. In 1895 we crossed the western end of this Chott, and, so as far as we could judge or learn, the Chott was without water in any part; it had been an exceptionally dry year, and the country between the mountains and the Djereed we found absolutely devoid of inhabitants.

Fig. 1.



Horns of "Addax": front view.

At El Oued there was in the fort a tame Addax familiarly called "*Begra*," and this was the only living specimen we saw during our journey. It was not a very good example, but had rather a fine pair of horns. It had been presented by some Chambas to the Commandant.

The best and strongest horns I know are a pair I purchased from an Arab who had come to Biskra *vid* Ouargla (see fig. 1, p. 811). They measure 34½ inches in length, 6½ in. round the base; 17½ in. between the tips, and 12½ in. between the horns at the lower outward curve.

The Chambas who have firearms shoot a great many of these Antelopes, and assure me that when there is a wind sufficiently strong to make the grass, broom (*Genista monosperma*?), and bushes wave, it is very easy to get them. They told me that they could easily take me where they were "like flies," and where I could get as many as ever I wished.

The Touaregs hunt the Begra el Ouash or "Tamita" with Sloughia (Greyhounds—the Saharian Greyhound is called a "sloughi" by the Arabs). The sloughia bring it quickly to bay, and the men go in and spear it.

Algeria and the Northern Sahara yield three distinct kinds of Gazelles (I know nothing of *Gazella rufina*). Old works which allude to these species are most confusing, and it is often impossible from their descriptions and names to know to which their remarks refer.

Shaw's accounts, so far as they go, of the wild animals of the Barbary States are comparatively clear. In alluding to the Gazelles, he says:—

"Besides the common Gazelle or Antelope" (i. e. *Gazella dorcas*) "(which is well known in Europe) this Country likewise produceth another Species of the same Shape and Colour, though of the Bigness of our Roe-Buck and with Horns sometimes of two foot long. This the Africans call Lidmee (*i. e.* the *Admi* or *Gazella cuvieri*), and may, I presume, be the Strepsiceros and Addace of the Antients . . ."

It is usual to regard the Dorcas as the "common Gazelle," but I have no doubt whatever that the Rhime (*G. loderi*) is by far the most numerous species in North Africa, and to be found over a very much more extended area than the Dorcas. The description given in the 'Proceedings' of this Society (1894, pp. 467–473) of the Algerian Gazelles is so complete that I shall confine myself to a very brief notice of the three species that I am familiar with.

(1) The Dorcas (*Gazella dorcas*), called by the Arabs generally "*Rhozal*," but when exactness is required "*Hemar*." They regard a large Dorcas as one of a separate race, and he is called *Bou Khrouma* (Large Throat), but the *Bou Khrouma* and *Hemar* are both alike the Dorcas Gazelle. The French discriminate between the Dorcas and the Rhime (*G. loderi*) by terming the former "Gazelle des Plaines," and the latter "Gazelle des Sables."

It is with great respect and diffidence that I object to the Dorcas being described (see P. Z. S. 1894, p. 467) as "the common Gazelle of the Algerian Sahara generally," for the Dorcas is not met with in the Sahara proper, so far as I can learn, and in the Eastern Algerian Sahara at least is not to be found south of lat. 33°. The Dorcas in the Eastern Province and in Tunisia is the common Gazelle of the plains immediately south of the Aures

Range, which form a sort of transitional zone between the mountains and the Sahara proper. Roughly speaking, this Gazelle is confined to a belt of country not more than 120 or 150 miles wide (and generally very much narrower). It may be found in plains, or even in low hills, within the southern mountain-chains, and on or near some of the sand-dunes on the confines of the Chotts. I have frequently seen it in the neighbourhood of the Chotts, but once into the Oued Souf and sand desert and all trace of it is lost and the Rhime takes its place. In the district of Sef el Menadi, where I have been twice with Sir E. G. Loder, and where he secured the first specimen of the Gazelle (the Rhime) which now bears his name, we found both Rhime and Dorcas on the same ground; and this place may be marked as the most northern limit which the Rhime ever inhabits, as it never leaves the sand, I think, whilst the Dorcas does not go much further south than this. Probably there are several of these isolated islands of sand where the Rhime may be found.

The best male Dorcas that I have shot had horns a little over 31 cm. in length, the best female 25 cm. (measured along the curve).

They vary a good deal in colour according to the ground they frequent, and there is a slight variety among members of the same band. In 1893 there was on the plain of Aïn Naga a pure white one, no doubt an albino; but though my hunter had frequently seen it, he was never able to find it for me.

(2) The Rhime (*Gazella loderi*), Arab "*El Rhime*," Tamahaq "*Hankut*," is the common Gazelle of the Sahara. Enormous numbers are killed by the Arabs in the neighbourhood of Rhadamis, and their skins dressed and dyed with a dye made from the rind of pomegranates and exported from Rhadamis. They are to be found throughout the region of the great Ergs and everywhere in the Sahara sands where there is vegetation sufficient to support them. The only places where they are to be met with, I believe, north of El Oued Souf, are to the south-west of Bou Chaama and near Sef el Menadi. A number of their horns are always on sale at Biskra and sometimes the skins. The male horns of the Rhime sometimes bear so close a resemblance to those of the Admi (*Gazella cuvieri*) that they are often sold and bought as such. The Admi horns are much less commonly seen than the Rhime; as a rule, they are to be distinguished. The general character of the Rhime horns as distinguished from the Admi are, so far as I can describe them, as follows:—

In the Rhime among average specimens the horns form in *their main outline* a long evenly-tapering V, whilst in the Admi the horns so far up from their base are more inclined to the parallel before springing out laterally, and towards the points usually take an inward and forward turn; this turn inward is rarer, though not uncommon, in the Rhime, but the forward bend at the top is common to both.

I have remarked, too, that the annulations or notches are as a

rule, deeper and more marked in the Admi, and stop more abruptly towards the points of the horns than is the case with the Rhime, which gradually fade into the smooth points.

Fig. 2.

Horns of "Rhime."

Fig. 3.

Horns of "Admi."

I *think* it will be found also that the line of annulations in the Rhime is generally horizontal or depressed from front to back, while in the Admi this line tends upwards. Besides this I have nothing more to add to the very full description of the *Gazella loderi* in the 'Proceedings,' by Mr. Thomas and Sir E. G. Loder. My best Rhime horns measure barely 35 cm. along the curve.

(3) The Admi (*Gazella cuvieri*) is known as *Admi*, *l'Admi*, or *l'Edmi* to the Arabs; it is also distinguished from the Dorcas "*Rhozal*" as "*Rhozal Djebel*" (Mountain Gazelle).

This Gazelle is by no means so rare as is generally supposed, though it is difficult to secure, its quickness and facility for eluding observation being equal almost to that of the Larrowi (*Ovis tragelaphus*). There is hardly a mountain in the southern ranges of the Aures where they are unknown, and I have seen them on almost every mountain from far to the N.W. of Biskra to the Tunisian frontier at Negrine. I know that they are common on the Djebel Cherchar, and I have seen them as far north as the hills and woods of Melagon, near Chelia. I have seldom seen more than eight in a herd, and far more frequently they are met with singly and in pairs, or bands of three to five. While frequenting the same difficult ground as the Larrowi, it is more usual to find them in larger numbers on those mountains which are lower than the highest. I have seen them on the plateaux and plains among the mountains, and they frequently descend at night to feed on the barley in the valleys, as also does the Larrowi. The best male horns I have measure rather more than 36 cm. along the curve.

4. On the Gazelles of Tunisia.

By Joseph S. Whitaker, F.Z.S.

[Received October 1, 1896.]

Gazella dorcas (Linn.).

The common Dorcas Gazelle is to be met with throughout the greater part of Central and Southern Tunisia, frequenting the vast semi-desert plains abundant in those districts, but not the more sandy inland country of the extreme south of the Regency, where it is replaced by another species. So far as I can ascertain, the Dorcas Gazelle never occurs in the Tell country; but I have found it in the neighbourhood of Kairouan, which is probably the extreme northern limit of the range of this species in the Regency. On the extensive plains to the west of Gafsa I have found it particularly abundant; and I understand it is plentiful in the neighbourhood of the Chott Djerid, and throughout a considerable portion of the coast-country of the south, but not in the true desert further inland, where sand-dunes take the place of the stony scrub-covered plains. It may occasionally stray into the sand country, but this is exceptional.

In winter the Dorcas Gazelle congregates in large herds, often numbering over one hundred individuals; but in spring these herds break up, and one then meets with the Gazelles in small parties or singly. The female *G. dorcas*, I am told, gives birth to but one young one at a time, and this generally in the month of April.

The horns of this species vary considerably both in size and in shape. As a rule, those of the adult male are stout, deeply annulate, and lyrate, measuring from 10 to 13 inches in length along the front curve; those of the female are much shorter, straighter, smoother, and more slender.

I may here mention that I have specimens of the Dorcas Gazelle from the country south of the Chott Djerid, which are somewhat paler in colour than the ordinary type. No doubt this variation in colouring is due to some difference in the nature of the soil and surroundings of the districts from whence these particular specimens came.

Gazella cuvieri (Ogilby).

The Mountain Gazelle, the *Edmi* or *Edem* of the Arabs—the Tunisians use the latter name—is to be found sparingly on most of the mountains throughout the Tunisian Regency. Essentially a mountain species, as its name implies, it never occurs, so far as I am aware, on the plains, or at any distance from hilly country.

I have met with the Edmi, and obtained specimens of it, on some of the higher ranges near Kasrin, in Central Tunis, and have found it in the south near Gafsa and Tamerza. In the north of the Regency it seems to occur on the mountains near Zaghouan, the extreme eastern range of the Atlas, and in the neighbourhood

of Ghardimaou, on the Algerio-Tunisian frontier, from both of which places M. Blanc, the naturalist in Tunis, tells me he has received specimens in the flesh. I myself have also been offered Edmi-shooting on an estate only some twenty miles or so south of Tunis. It seems evident, therefore, that the species has a wide range in the Regency, although perhaps it is nowhere very abundant.

In Algeria, as shown by Mr. E. N. Buxton [1] and Sir Edmund Loder [2], the Edmi occurs on the mountains of the Atlas, notably on the Aurès range, and I myself have seen freshly-killed specimens of it in the Biskra market; but probably the species has a more limited range in Algeria than further east, in Tunisia, where the character of the country, and more particularly of the mountains, is more compatible with the requirements of this animal.

G. cuvieri is to be found either in small herds or singly, and occasionally, though not as a rule, at a considerable elevation. On the Djebel Selloum and Djebel Semama, near Kasrin, both of which mountains are nearly 4000 feet above sea-level, I found the Gazelles about halfway up. These mountains, although steep in places and with some very rugged scarps, are in great part well-wooded with Aleppo pines, and on the lower slopes with a thick undergrowth of the usual *maquis* vegetation. In this brushwood the Gazelles easily escape detection and are naturally not very often seen. Although fond of cover, the Edmi will adapt itself to circumstances, and seems equally at home on the arid mountains of the south, where there is but little vegetation, and that merely of a dwarf description, affording slight shelter. In the spring, when my hunting-trips after Aoudad (*Ovis tragelaphus*) and Edmi have taken place, there has always been a little water on these mountains; but for some months of the year, I am told, the water-courses are dry, and the animals then, should they wish to drink, must travel some distance. That both these species, however, shift their quarters constantly I feel convinced, force of circumstances rendering them as *nomad* as the Arabs themselves.

The Edmi is very much larger than the Dorcas Gazelle, its weight being almost double. Its coat is darker in colour and with rather longer and coarser hair, while its knees, besides having very strongly developed brushes, show distinct callosity. The horns in the adult male are very stout and deeply annulated, and generally with but little curve, measuring about 13 inches, or even more in fine specimens. Those of the female are much more slender and smoother, but sometimes of fair length, some in my possession measuring 11 inches.

GAZELLA LODERI, Thos. (P. Z. S. 1894, p. 470, pl. xxxii.)

This pale desert Gazelle, only recently scientifically described, and named by Mr. Oldfield Thomas after Sir Edmund Loder, is

[1] See Buxton, P. Z. S. 1890, p. 363.
[2] See Loder, P. Z. S. 1894, p. 473.

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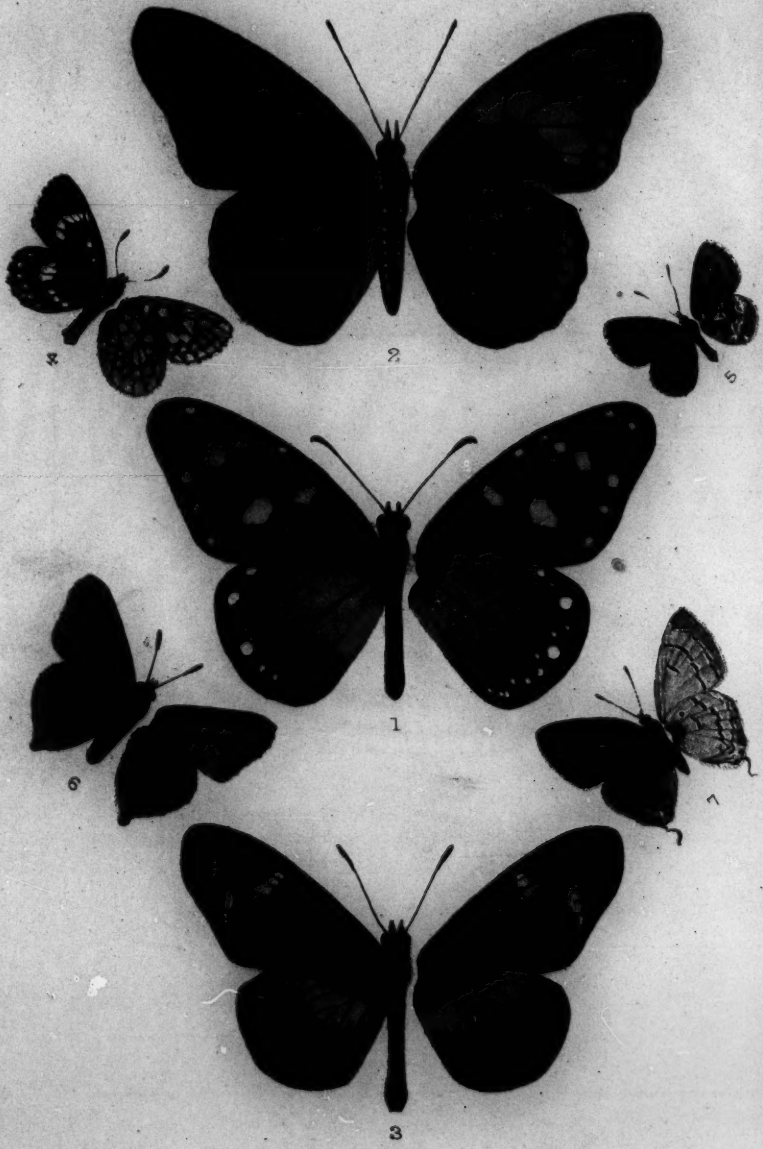

E.C.Knight del. et lith. West, Newman chromo.

New Lepidoptera from Nyasa-land.
Collected by Mr Crawshay

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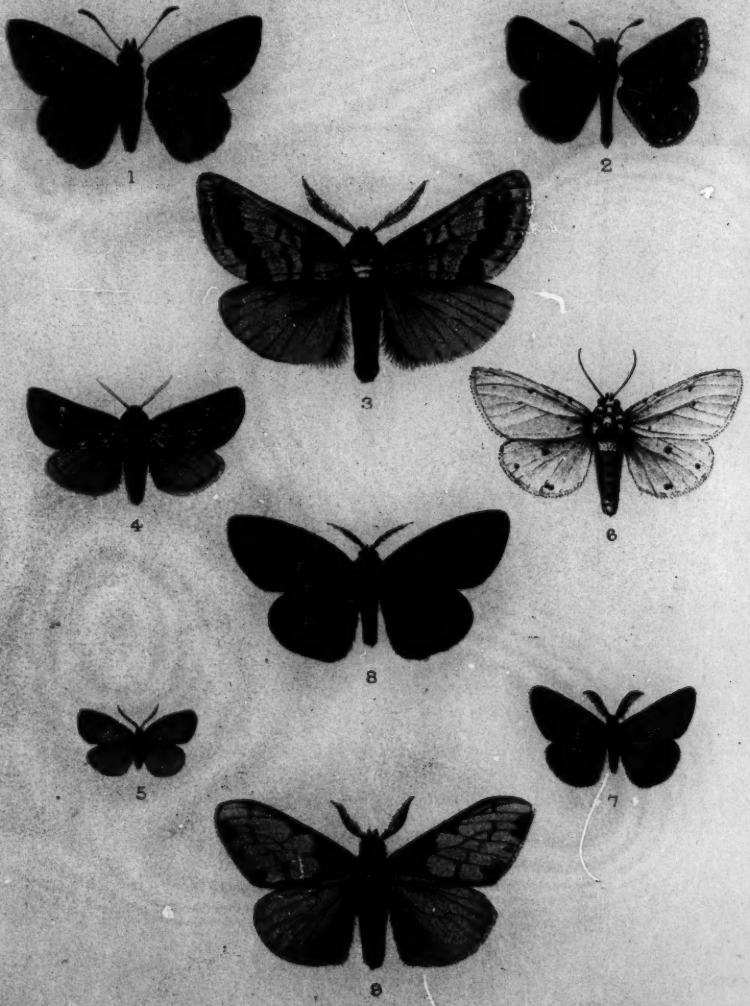

E.C.Knight del.et lith. West, Newman chromo.

New Lepidoptera from Nyasa-land.

Collected by Mr Crawshay

known to the Tunisian Arabs by the name of *Ghazel abied* or *Reséll abied*, meaning the *White* Gazelle, its Algerian name *Reem* or *Rim* being apparently unknown in Tunis.

It seems to be a true desert species, never occurring out of the sand-dune country, where it replaces *G. dorcas*; and while the home of the latter species is the semi-desert country, with its vast stony plains, covered with scanty scrub vegetation, the habitat of *G. loderi* is undoubtedly the more arid region of sand wastes further south.

Herr Spatz, who has resided for several years in the south of Tunis, and is well acquainted with this Gazelle, informs me that it is common in the inland country of the extreme south of the Regency, being first met with at about 25 to 30 miles south of the Chott Djerid. In the districts where it occurs it is plentiful, and is generally to be found in small herds; but owing to its very pale colour, which harmonizes so well with that of the desert surroundings, it is not easily distinguished at a distance, and being, moreover, extremely shy and wary, a near approach is not often possible. The nomad Arabs, however, who are nearly all sportsmen, kill a good many, and every year some 500 to 600 pairs of horns of this species are brought by the caravans coming from the interior to Gabes, where they find a ready sale among the French soldiery.

Herr Spatz confirms what Sir Edmund Loder says of this species never drinking, and, as to its food, says it subsists on the leaves and berries of the few desert plants to be found in the sand wastes. The female of *G. loderi*, according to Spatz, often has *two* young ones at a birth, differing in this respect from *G. dorcas*, which seems to have but one.

So good a description of *G. loderi* has been given by Mr. Thomas (P. Z. S. 1894, p. 470), that I can add nothing thereto, except it be merely to say that the coat of this Gazelle is extremely fine and short-haired, and that in specimens which I have the knee-brushes are so slightly developed as to be scarcely noticeable or worthy of the name.

5. On two Collections of Lepidoptera made by Mr. R. Crawshay in Nyasa-land. By Arthur G. Butler, Ph.D., F.L.S., F.Z.S., &c., Senior Assistant-Keeper, Zoological Department, British Museum.

[Received August 18, 1896.]

(Plates XLI. & XLII.)

A few days before his return to England a small collection of Lepidoptera reached me from Mr. Crawshay, accompanied by a letter, in which he stated that it was from quite a new locality, "viz. from Senga, the Loangwa River valley—which, as you can see, drains into the Upper Zambesi River, and not into this lake.

"So far as I know, only two Europeans have ever visited Senga besides myself, one of whom was poor Mr. Glave, who died lately when crossing the continent from east to west. No one, I think, has ever done any natural history collecting there.

"In August and September last I had occasion to make a journey into Senga, for the purpose of investigating the slave-trade, and this afforded me an opportunity of shooting and natural history collecting.

"I got together a number of Antelopes' heads, some land-shells, and about sixty species of Butterflies—some of which I take to be new, for I have never before seen anything like them. Had the state of the country permitted it, I would have prolonged my journey and done more; but the Senga slave-traders proved hostile: twice we were fired on; and, having no fighting force at my disposal, I was obliged to retrace my steps.

"However, everything taken into consideration, I am well pleased with what little I got; the Butterflies certainly are very interesting, and will furnish, I should think, six or seven new species, if not more.

"Returning from Senga, then, I revisited Henga (3½ days S.W. from this), and there I spent about six weeks for the purpose of shooting. It was not a good time of year for insects, being just the end of the dry season: however, I took a few, one a large spotted 'Blue'—the largest 'Blue' I think I ever saw, but not anything gorgeous, which may be something good. This and one or two other insects I will send you, all in the same box."

We had commenced mounting the Butterflies in this very interesting consignment when Mr. Crawshay reached England, bringing with him two other boxes of Lepidoptera collected by him in or near the Deep Bay district. I have therefore thought it best to combine the account of the two collections in one paper.

As, of late years, the minds of Lepidopterists have been greatly exercised respecting the seasonal forms of Butterflies, I asked Mr. Crawshay whether he could give me information respecting the duration of the wet and dry seasons in British Central Africa. He now sends me the following particulars, which will doubtless prove of considerable value to the students of dimorphism:—

"No precise limit can be laid down to define the rainy and dry seasons throughout the whole of British Central Africa. The seasons vary in the various localities: in the first place, latitude has to be taken into consideration; then, again, the rains of the hills set in earlier than those of the plains.

"In the *Shiri highlands*, which on the mean are over 3000 feet alt., the first rains fall about the end of September or the beginning of October, according to the phase of the moon; these are the preliminary rains, and they last only two or three days, as a rule. Then succeeds a dry period of some three weeks or so. After this the heavy rains set in, and continue until the middle or end of April—some years a little earlier or later than this.

"This year I happened to be at Blantyre at the end of April

and the beginning of May: it rained then almost every day, up to the date of my departure on or about May 12th.

"On the *Lower Shiri plains* the wet season does not set in until later: no rain falls at Chiromo, I think, before the middle of November. The last day or two of October, 1894, when travelling by land from Chiromo to Blantyre, I came in for light rains on reaching the foot of the hills at the back of the Elephant marsh.

"Further north, on *Lake Nyasa*, the rains commence later by about a month or six weeks, on the mean: much, however, depends on locality—whether the country is plain or hilly, and, again, bare or forested.

"Take for instance *Deep Bay*, about 10° 30′ S. lat., and roughly some ninety miles from the north end of the lake. Here there are low hills attaining a height of some 400 feet above the lake, and behind these again is low undulating country extending some twelve or fifteen miles inland, to the foot of the Nyika plateau, which attains on the mean a height of 7400 feet, the accepted altitude of Lake Nyasa being some 1600 odd feet.

"No rain falls at Deep Bay before the middle of November, sometimes not until later. In 1893 there was no rain before December, when there were two or three preliminary showers. The heavy rains did not set in until January 8, 1894. In 1895 there were some very heavy preliminary rains in November; the heavy rains set in, in good earnest, with the waning moon in December of that year.

"The rains continue until about the middle of May, sometimes a week or two later; the heavy rains slack off at the end of March. The heaviest rains of the year are between February and March; after that it rains fitfully, at intervals of every two or three days.

"In 1889 it rained all May, very heavily too during the first half of the month. In 1893 there were two very heavy downpours on the 17th and 18th July, fully five or six weeks after the dry season had set in.

"In *Nyika* the rains commence a good deal earlier and last longer. It is a very moist country indeed; the higher parts of it can hardly be said to have any dry season, as there are rainy mists all the year through. The first *rains* fall about the end of September or the beginning of October. The rainfall of these mountains rather resembles that of Northern Europe, Ireland especially: it rains thickly but lightly, and for days on end at times; there are not the heavy downpours which are experienced at lower altitudes.

"A hundred miles or so south of Deep Bay, at *Bandawe*, the rains set in earlier than at Deep Bay; this may be attributed to the fact that Bandawe is a hilly promontory, abutting from high mountainous country, some of the rainfall of which finds its way down to the lake along the neck of connecting highland. If I recollect rightly, I experienced a shower or two of rain when

camped at Bandawe about the last day of October, 1885. Bandawe, I might here mention, is a terrible spot for thunderstorms.

"In *Henga*, the valley of the Upper Lunyina River, 3300 feet alt., on the mean, some fifty miles S.W. of Deep Bay, the early rains fall about the beginning of November and the rainy season ends about the beginning of May, though there may be, and very often are, a good few showers after that.

"On the *Konde plains*, which commence about thirty miles north of Deep Bay and extend to the lofty Wakinga Mountains in German territory, the rains are a week or two later than at Deep Bay. At *Karonga*, the terminus of the so-called Nyasa-Tanganyika "road" (no road in reality exists—it is only a native track), the first rains do not fall before the beginning of December, as a rule. The dry season there commences at the beginning of May, or possibly a little earlier, according to the phase of the moon.

"The Nyasa-Tanganyika plateau:—rains commence in November, about the beginning of the month on the escarpments of the plateau, and about a fortnight later halfway across, and last until the end of April. The rainfall is very heavy, especially at the extremities of the plateau: nevertheless, towards the end of the dry season, much of it is a desert almost, for want of water.

"In the Loangwa River valley, Senga, some seven or eight days' journeying on foot S.W. of Karonga, the preliminary rains commence in September; and, I believe, the rainy season lasts till May, though I was not there to see this for myself. In August, 1895, I found the Loangwa valley completely burnt up; on September 10th we had rain, also on one or two days subsequently.

"In the Eastern watershed of the Congo, *i. e.* on Lake Mweru, and in Kabwiri and Itawa, the preliminary rains fall in September, and the rainy season lasts on into May. During my period of residence on Lake Mweru, I found the rainy season of 1891–1892 ended May 6th on the level of the Lake; a fortnight later on the plateau to the eastward: the preliminary rains of 1892–1893 again began on September 4th, some three weeks earlier than was the case in 1891."

All Mr. Crawshay's captures having been carefully dated, it will now be possible for any Lepidopterists, by going through my published papers, to discover whether a form was obtained in the dry or wet season; in any case it is certain that some of the supposed distinctly *seasonal* forms were all captured at the same spot on the same day, and (to judge by their excellent condition) must have emerged from the pupa about the same time; but I am told that this fact does not militate against the view that they are dry- and wet-season forms! Personally, I fail to understand how an insect which flies abundantly in the middle of the rainy season can be called a "dry-season form"; I can only suppose that the expression "dry season" is not to be understood literally, but merely as indicating a type of form and colouring prevalent during the dry season, though often occurring during the rains.

The following is a list of the species in the two series last collected by Mr. Crawshay, among which are twenty new to science, some being of considerable interest.

1. AMAURIS ANSORGEI.

Amauris ansorgei, E. M. Sharpe.

Kasungu Mountain, 7200 feet alt., Nyika, March 3rd, 1896.

2. AMAURIS CRAWSHAYI, sp. n. (Plate XLI. fig. 1.)

Intermediate between *A. albimaculata* and *A. whytei*: the primaries having the form and pattern of the former, but the ground-colour is much deeper, glossed with indigo; the pattern of the secondaries corresponds with that of *A. whytei*, excepting that the submarginal spots are better defined and pearl-white and the broad belt paler and more creamy. Expanse of wings 80 millim.

♂ ♂, Kapora, Songwe plain, 2nd March, 1895; Nkata Bay, W. coast of Lake Nyasa, 14th March, 1896.

3. LIMNAS CHRYSIPPUS.

Papilio chrysippus, Linnæus, Mus. Lud. Ulr. p. 263 (1764).

♂, Kasungu Mountain, 7425 feet alt., Nyika, March 4th, 1896.

4. GNOPHODES DIVERSA.

Gnophodes diversa, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 333 (1880).

♀, Mkamasi River, Nyasa to Tanganyika Road, August 22nd, 1895.

"White ova" (*R. C.*).

5. MELANITIS SOLANDRA.

Papilio solandra, Fabricius, Syst. Ent. p. 500 (1775).

♀, Leya, Deep Bay, W. coast of Lake Nyasa, June 4th, 1895
Var. *fulvescens*. Nkata Bay, March 14th, 1896.

"Emerald-green ova" (*R. C.*).

6. APHYSONEURIA PIGMENTARIA.

Aphysoneuria pigmentaria, Karsch, Ent. Nachr. xx. p. 191 (1894).

♀, Kasungu Mountain, 7425 feet alt., March 3rd, 1896.

"Pearly-white coloured ova" (*R. C.*).

7. PHYSCÆNURA PIONE.

♀. *Physcænura pione*, Godman, P. Z. S. 1880, p. 183, pl. xix. figs. 2, 3; ♂. Trimen, l. c. 1894, p. 20, pl. iv. fig. 1.

Fuleriva forest, Deep Bay, March 6th, 1896.

Seven examples were obtained; but, as we already possess a sufficient series of this pretty species, none were retained for the Museum collection.

8. SAMANTA SIMONSI.

Mycalesis simonsii, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 458 (1877).

♂ ♂, Karonga plain, 1670 feet alt., N.W. coast of Lake Nyasa, August 20th; ♀, Virauli Mountain, Nyasa to Tanganyika Road, August 22nd, 1895.

Said to be, without question, the dry-season form of *S. perspicua*: this is quite possible, inasmuch as all the specimens now sent were obtained at the height of the dry season. The difference between the two forms is one of colour rather than of pattern or outline; also, as might be expected, the ocelli are reduced in size. The chief objection is that the nearly related *S. eliasis* is a native of a humid country, and has no wet-season form corresponding with *S. perspicua*.

9. CHARAXES SATURNUS, var. LATICINCTUS.

Charaxes saturnus, var. *laticinctus*, Butler, P. Z. S. 1895, p. 252.

♂, Vuwa, W. coast of Lake Nyasa, August 16th, 1895.

10. CHARAXES DRUCEANUS.

Charaxes druceanus, Butler, Cist. Ent. i. p. 4 (1869); Lep. Exot. p. 26, pl. x. fig. 4.

♂, Lumpi River, Lower Nyika, Nov. 30th, 1895.

"Taken on a putrefying Eland's head, while on a porter's head" (*R. C.*).

11. CHARAXES ACHÆMENES.

Charaxes achæmenes, Felder, Reise der Nov., Lep. iii. p. 446, pl. lix. figs. 6, 7 (1867).

♂, Deep Bay, March 6th, 1896.

12. CHARAXES GUDERIANA.

♂. *Nymphalis guderiana*, Dewitz, Nova Acta Akad. Naturf. Halle, 1879, p. 200, pl. 2. fig. 18.

♀. *Charaxes guderiana*, Butler, P. Z. S. 1893, p. 648; Trimen, P. Z. S. 1894, pl. v. fig. 8.

♀, Deep Bay, Jan. 17th, 1896.

"Taken feeding upon over-ripe bananas in my veranda;" contained a "prodigious quantity of bright emerald-green ova" (*R. C.*).

13. CHARAXES MANICA.

♀. *Charaxes manica*, Trimen, P. Z. S. 1894, p. 43, pl. vi. fig. 9.

♂, Kapora, Songwe plain, N.W. Nyasa, March 3rd, 1895 (*J. B. Yule*); ♀, Mtambwi Hill, Deep Bay, July 1st, 1895.

The female is larger than in Mr. Trimen's figure, and, on the upper surface, reminds one strongly of *C. bohemanni* ♀; it is a good deal shattered, having evidently been long on the wing. Mr. Crawshay says of it:—"A rare and almost impossible insect

to take: it flies high and fast, and thus is the only specimen I have ever had a chance of taking." I now have no doubt that one of the males recorded in my paper in the 'Annals and Magazine of Natural History,' 1896, xviii. p. 68, as "*C. ethalion* (Eastern type)," and taken on the Upper Leya, on the same day as the male above noted, belongs to this species; but when identifying it I had no female for comparison.

14. CHARAXES LEONINUS.

Charaxes leoninus, Butler, P. Z. S. 1895, p. 253, pl. xv. fig. 2.

♂, Lower Nyika, June 14th, 1895.

15. CHARAXES ZOOLINA.

Nymphalis zoolina, Westwood & Hewitson, Gen. Diurn. Lep. pl. liii. fig. 1 (1850).

♂, Mpimbi, Upper Shiri River, March 24th, 1896.

A much-shattered example, but the first we have received from Nyasa-land.

16. PANOPEA HELIOGENES. (Plate XLI. fig. 2.)

Panopea heliogenes, Butler, Ann. & Mag. Nat. Hist. ser. 6, vol. xviii. p. 69 (1896).

♀, Mitanji, W. of Deep Bay, May 19th, 1895.

17. HYPOLIMNAS MISIPPUS.

Papilio misippus, Linnæus, Mus. Lud. Ulr. p. 264 (1764).

♂ ♂, ♀, Deep Bay, Feb. 5th, 6th, 8th, 11th, 27th, and 29th, 1896.

18. JUNONIA PELASGIS.

Vanessa pelasgis, Godart, Enc. Méth. ix., Suppl. p. 820 (1823).

♀, Kasungu Mountain, 7425 feet alt., Nyika, March 2nd, 1896. "Emerald-green ova" (*R. C.*).

19. JUNONIA ARCHESIA.

Papilio archesia, Cramer, Pap. Exot. iii. pl. ccxix. figs. D, E (1782).

Henga, W. of Lake Nyasa, June 26th, 1895.

20. JUNONIA CALESCENS.

Junonia calescens, Butler, P. Z. S. 1893, p. 652.

Mtambwi Hill, January 6th; Deep Bay, Feb. 5th, 6th, 11th, 15th, and 21st, 1896.

21. JUNONIA CUAMA.

Junonia cuama, Hewitson, Exot. Butt. iii., *Jun.* pl. 1. figs. 2, 3 (1864).

Mtambwi Hill, July 1st, 1895.

Said to be the extreme dry-season form of *J. simia*, but we have it from Zomba taken in the wet season.

22. JUNONIA TRIMENI.

Junonia trimenii, Butler, P. Z. S. 1893, p. 651, pl. lx. fig. 4.

♂, ♀, Kondowi, 4000 feet alt., Nyika, Feb. 21st, 1896.

Said to be the form occurring between the wet and dry seasons; but, from what Mr. Crawshay says of Nyika, there ought to be no dry-season forms there. At Zomba it occurs (in company with *J. simia*) in July and (in company with both *J. simia* and *J. cuama*) in December: indeed, if we had a larger series of each of these species, I believe it would be possible to prove that they always fly simultaneously. The female of *J. trimeni* noted above has dry-season characters on the under surface.[1]

23. JUNONIA SIMIA.

Precis simia, Wallengren, Kongl. Svenska Vetensk.-Akad. Handl. 1857, p. 26.

Deep Bay, Feb. 13th and 23rd, 1896.

24. JUNONIA TUGELA.

Precis tugela, Trimen, Trans. Ent. Soc. London, 1879, p 334; South Afr. Butt. vol. i. p. 241, pl. iv. fig. 5 (1887).

♂, Mtambwi Hill, Deep Bay, July 1st, 1895.

This makes the second dated example which we have received, the first dated specimen having been obtained in September: on the other hand, *J. aurorina* (which might well be the wet-season form of *J. tugela*) appears, from our dated specimens, to fly from December to April. In South Africa Mr. Trimen records specimens of *J. tugela* as taken in March and May; whether the dry season commences so early as March on the Tugela River I do not know.

25. JUNONIA CLELIA.

Papilio clelia, Cramer, Pap. Exot. i. pl. xxi. E, F (1779).

Deep Bay, February 1st, 1896.

26. JUNONIA BOÖPIS.

Junonia boöpis, Trimen, Trans. Ent. Soc. London, 1879, p. 331.

♀, Luvira River, Nyasa to Tanganyika Road, August 23rd, 1895.

27. JUNONIA CEBRENE.

Junonia cebrene, Trimen, Trans. Ent. Soc. London, 1870, p. 353.

Deep Bay, Feb. 5th, 8th, and 15th, 1896.

28. JUNONIA NATALICA.

Precis natalica, Felder, Wien. ent. Monatschr. iv. p. 106 (1860).

♀, Deep Bay, March 10th, 1896.

"Bright green ova" (*R. C.*).

[1] Why a pair taken on the same day should differ in the features supposed to characterize the two seasons, and in a country where it is never really dry, is a riddle which I do not pretend to solve.—A. G. B.

29. PROTOGONIOMORPHA ANACARDII.

Papilio anacardii, Linnæus, Mus. Lud. Ulr. p. 236 (1764).

Namitembo, Zomba Mountain, March 25th; Chiradzulu, Shiri Highlands, March 30th, 1896.

30. HYPANARTIA HIPPOMENE.

Hypanartia hippomene, Hübner, Samml. exot. Schmett. ii. pl. 25. figs. 3, 4 (1806).

♀, Kantorongondo Mountain, Nyika, June 30th, 1895; ♂ ♂, ♀, Kasungu Mountain, 7425 feet alt., Nyika, March 3rd, 4th, and 5th, 1896.

♀, "Having an extraordinary quantity of grass-green ova" (*R.C.*).

31. HYPANARTIA SCHŒNEIA.

Eurema schœneia, Trimen, Trans. Ent. Soc. London, 1879, p. 329; South Afr. Butt. i. p. 207, pl. iv. fig. 1 (1887).

♂ ♂, Kasungu Mountain, 7200 feet alt., Nyika, March 3rd and 4th, 1896.

My supposition (P. Z. S. 1895, p. 727) that this might prove to be the dry-season form of *H. hippomene* (since confidently asserted to be the fact, by a practical collector) is now shown to be incorrect, inasmuch as not only were both species caught on the same mountain on two successive days, but at that time of year which might perhaps be called the rainy season, were it not that there appears to be no really dry season in Nyika.

32. EUPHÆDRA NEOPHRON.

Romaleosoma neophron, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 640; Peters' Reise nach Mossamb., Zool. v. p. 386, pl. xxii. figs. 1, 2 (1862).

♂, Kapora, Songwe plain, in banana-grove, March 6th, 1895; ♀ ♀, Leya, Deep Bay, June 4th; Lupembi, W. coast of Lake Nyasa, in shady banana-grove, August 19th, 1895; ♂, ♀, Mpimbi, Upper Shiri River, March 24th and 25th, 1896.

33. EUXANTHE WAKEFIELDI.

Godartia wakefieldii, Ward, Ent. Month. Mag. x. p. 152 (1873); Afr. Lep. pl. 6. fig. 3 (1874).

Nkata Bay, W. coast of Lake Nyasa, March 14th, 1896.

34. HAMANUMIDA DÆDALUS.

Papilio dædalus, Fabricius, Syst. Ent. p. 482 (1775).

♀, Deep Bay, Feb. 17th, 1896.

35. METACRENIS CRAWSHAYI.

Crenis crawshayi, Butler, P. Z. S. 1893, p. 654, pl. lx. fig. 5.

♀, Fuleriva forest, Deep Bay, Feb. 28th, 1896.

"Full abdomen: one fully-developed ovum, pinkish-coloured" (*R. C.*).

36. METACRENIS ROSA.

Crenis rosa, Hewitson, Ent. Month. Mag. xiv. p. 82 (1877).

♂, Deep Bay, Oct. 17th, 1895.

"Rarely met with and very difficult to take: flies swiftly with gliding flight, and perches high" (*R. C.*).

37. PSEUDARGYNNIS HEGEMONE.

Argynnis hegemone, Godart, Enc. Méth. ix. p. 258 (1819).

♂, Mtambwi Hill, Deep Bay, July 1st, 1895.

38. ARGYNNIS SMARAGDIFERA.

Argynnis smaragdifera, Butler, P. Z. S. 1895, p. 629, pl. xxxv. figs. 1, 2.

♀, Cheni-Cheni Mountain, 7400 feet alt., Nyika, June 30th, 1895.

♂ ♂, ♀ ♀, Kasungu Mountain, 7425 feet alt., Sept. 2nd, 1893; March 1st to 5th, 1896.

The ova of the females are said to vary from yellow to orange in colour.

The following description of the egg of this species was made by Mr. F. W. Frohawk from a single specimen found attached to a female obtained by Consul Sharpe at Zomba:— "The ovum, of the usual *Argynnis* form, conical in shape and measuring $\frac{1}{34}$ inch high, with about twenty longitudinal keels, irregular and varying in length; some running for only two-thirds the distance from base to apex, others terminating before reaching the summit, eight only extending the entire length. It is ribbed transversely by about twenty in number, the ribs being irregularly distributed and widely separated near the summit, gradually becoming closer and shallower until finally disappearing at the base.

"In general structure this egg very closely resembles that of *A. selene* (very much more than that of either *A. euphrosyne* or *lathonia*), the number and formation of the keels and ribs being similar in both species. It differs most from *A. lathonia*, *A. euphrosyne* being intermediate between *A. smaragdifera* and *A. lathonia*."

39. NEPTIS INCONGRUA.

♀. *Neptis incongrua*, Butler, P. Z. S. 1896, p. 112, pl. vi. fig. 2.

♂ ♂, Kasungu Mountain, 6200 to 7425 feet alt., Nyika, March 1st, 3rd, and 5th, 1896.

The male sometimes differs from the female in having the ground-colour of the under surface mahogany-red.

40. NEPTIS AGATHA.

Papilio agatha, Cramer, Pap. Exot. iv. pl. cccxxvii. A, B (1782).

Deep Bay, March 6th, 1896.

41. PLANEMA SCALIVITTATA. (Plate XLI. fig. 3.)

Planema scalivittata, Butler, Ann. & Mag. Nat. Hist. ser. 6, vol. xviii. p. 159 (1896).

Kasungu Mountain, 7425 feet alt., Nyika, March 1st, 1896.

42. ACRÆA ANACREON.

Acræa anacreon, Trimen, Trans. Ent. Soc. London, 1868, p. 77, pl. vi. figs. 3–5.

Var. *Acræa bomba*, H. G. Smith, Ann. & Mag. Nat. Hist. ser. 6, vol. iii. p. 128 (1889); Rhop. Exot. i., *Acr.* pl. iii. figs. 5, 6 (1892).

Typical form, Chuona River (Mwewe's town), Unyika, Sept. 15th, 1895.

Var. *Acr. bomba*. Same locality and date.

43. ACRÆA GUILLEMEI, var. PERIPHANES.

Acræa periphanes, Oberthür, Études, livr. xvii. p. 20, pl. 2. fig. 23 (1893).

Kondowi, 4000 feet alt., Nyika, Feb. 21st, 1896.

A somewhat aberrant example, slightly larger than usual, in some respects intermediate between typical *A. guillemei* and *A. periphanes*, but with the spots on the border of the secondaries strongly developed.

44. ACRÆA DOUBLEDAYI, var. DIRCÆA, Butl. (*nec* Westw.).

Acræa doubledayi, Guérin, Lefebvre's Voy. en Abyss. vi. p. 378 (1847).

♂, Nyika, 4500 feet alt., west of Lake Nyasa, June 26th; ♀, Luvira River, Nyasa to Tanganyika Road, Sept. 19th, 1895.

This is the form with a black apical patch, answering to Westwood's description; but Mr. Marshall, who has examined the type, informs me that the latter does not differ from *A. caldarena*.

45. ACRÆA CALDARENA, var. NELUSCA.

Acræa caldarena, Hewitson, Ent. Month. Mag. xiv. p. 52 (1877).

Var. *Acræa nelusca*, Oberthür, Études, livr. iii. p. 25, pl. 2. figs. 2, 3 (1878).

♀, Deep Bay, Feb. 8th, 1896.

46. ACRÆA ASEMA.

Acræa asema, Hewitson, Ent. Month. Mag. xiv. p. 52 (1877); Trimen, P. Z. S. 1894, p. 24, pl. iv. figs. 3, 3*a*.

Loangwa River, Senga, Sept. 3rd, 1895.

47. ACRÆA INSIGNIS.

Acræa insignis, Distant, P. Z. S. 1880, p. 184, pl. ix. fig. 4.

Kasungu Mountain, 5945 feet alt., Nyika, Feb. 29th; and 7200 feet alt., March 5th, 1895.

48. ALÆNA RETICULATA. (Plate XLI. fig. 4.)

Alæna reticulata, Butler, Ann. & Mag. Nat. Hist. ser. 6, vol. xviii. p. 160 (1896).

♂, Kasungu Mountain, 5400 feet alt., Nyika, March 5th, 1896; ♀, Mtambwi Hill, Deep Bay, Jan. 6th, 1896.

49. Polyommatus bæticus.

Papilio bœticus, Linnæus, Syst. Nat. i. 2, p. 789 (1767).

♂, Deep Bay, May 2nd, 1895; ♀, Feb. 15th, 1896; ♂, Loangwa River, Senga, Sept. 9th, Henga, 3200 feet alt., Nov. 7th, 1895.

50. Catochrysops glauca.

Lycæna glauca, Trimen, South Afr. Butt. ii. p. 21 (1887).

♂♂, ♀♀, Fuleriva forest, Deep Bay, Feb. 28th and March 6th, 1896.

51. Catochrysops asteris.

Polyommatus asteris, Godart, Enc. Méth. ix. p. 657 (1819); Trimen, South Afr. Lep. ii. pl. viii. figs. 3, 3*a* (1887).

♀, Mtambwi Hill, Deep Bay, Jan. 1st, 1896.

52. Catochrysops perpulchra.

♀. *Lycæna perpulchra*, Holland, 'Entomologist,' xxv. Suppl. p. 90 (1892); Proc. Unit. States Nat. Mus. xviii. p. 239, pl. vii. fig. 7 (1895).

♂♀. *Castalius hypoleucus*, Butler, P. Z. S. 1893, p. 660.

Lycæna exclusa, Trimen, P. Z. S. 1894, p. 47.

♀, Henga, W. of Lake Nyasa, Oct. 26th, 1895.

"Caught in my hat, out in the early morning. Bright emerald-green ova" (*R. C.*).

Now that a really good example has come to hand, I find that this species is undoubtedly a *Catochrysops* of the *C. asteris* group.

53. Everes jobates.

Lycæna jobates, Hopffer, Ber. Verh. Ak. Berlin, 1855, p. 642; Peters' Reise nach Mossamb. v. p. 408, pl. 26. figs. 9, 10 (1862).

♂♂, ♀, Kondowi, 4000 feet alt., Nyika, Feb. 21st; ♂, Kasungu Mountain, 5345 feet alt., Feb. 29th; ♀♀, 7425 feet, March 1st and 2nd; ♂, 7200 feet, Nyika, March 5th; ♀, Mitanji, W. of Deep Bay, May 19th, 1895.

♀, "Light green ova" (*R. C.*).

54. Everes mahallokoæna.

Lycæna mahallokoæna, Wallengren, Kongl. Svensk. Vet.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 41; Trimen, Trans. Ent. Soc. London, 1870, p. 366, pl. vi. figs. 7, 8.

Lisenga, 4500 feet alt., Mbalizi valley, Unyika, Sept. 16th, 1895; Kondowi, 4000 feet alt., Nyika, Feb. 21st, 1896.

55. Tarucus plinius.

Hesperia plinius, Fabricius, Ent. Syst. iii. 1, p. 284 (1793).

♂, Henga, Nov. 20th, 1895; ♀, Kasungu Mountain, 6200 feet alt., Nyika, March 1st; Deep Bay, Feb. 23, 1896.

56. AZANUS SIGILLATUS.

Lampides sigillatus, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 483 (1876).

♂ ♂, Henga, W. of Lake Nyasa, Nov. 20th, 1895.

"Perches on branches of trees" (*R. C.*).

57. NACADUBA SICHELA.

Lycæna sichela, Wallengren, Kongl. Svensk. Vet.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 37.

♂ ♂, Henga, W. of Lake Nyasa, Nov. 20th, 1895.

"Very active on the wing" (*R. C.*).

In Mr. Trimen's description of this rare butterfly the upper surface is said to be "silky dark-violaceous"; but I find that the colouring is particularly liable to deepen in the damping-pan (often in patches): an example which has wholly escaped this discoloration, if one sits between it and the light, is of the same beautiful lilac as the European "Common Blue,"[1] with a narrow, tapering blackish border to the outer margin; but if held between one and the light, it changes to a sickly greenish grey, more nearly approaching the colouring of *Plebeius orbitulus*.

58. CASTALIUS CALICE.

Lycæna calice, Hopffer, Ber. Verh. Ak. Berl. 1855, p. 642; Peters' Reise nach Mossamb. v. p. 405, pl. 26. figs. 4, 5 (1861).

Lower Nyika, June 14th, 1895.

59. LYCÆNESTHES ADHERBAL.

♀. *Lycæna adherbal*, Mabille, Bull. Soc. Zool. France, 1877, p. 217.

♂. *Lycænesthes lunulata*, Trimen, P. Z. S. 1894, p. 51, pl. vi. fig. 12.

♀, Kondowi, 4000 feet alt., Nyika, Feb. 21st, 1896.

"Emerald-green ova" (*R. C.*).

60. LYCÆNESTHES LIODES.

♂. *Lycænesthes liodes*, Hewitson, Trans. Ent. Soc. London, 1874, p. 349.

♀, Kondowi, Nyika, Feb. 2nd, 1896.

61. ZIZERA KNYSNA.

Lycæna knysna, Trimen, Trans. Ent. Soc. London, 3rd ser. vol. i. p. 282 (1862).

♂ ♂, Deep Bay, Feb. 24th and 26th, March 8th, 1896.

"Never plentiful; an odd one met with here and there. A very low flier, hovers within an inch or so of the ground, and has to be dredged off it almost with the net" (*R. C.*).

[1] I believe this species now stands under the name of *Cupido icarus*.

62. ZIZERA GAIKA.

Lycæna gaika, Trimen, Trans. Ent. Soc. London, 3rd ser. vol. i. p. 403 (1862).

♂ ♂, Luvira River, Nyasa to Tanganyika Road, August 23rd, 1895.

63. ZIZERA LUCIDA.

Lycæna lucida, Trimen, Trans. Ent. Soc. London, 1883, p. 348.

♂, Virauli Hill, Nyasa to Tanganyika Road, August 22nd; ♀ ♀, Chuona River (Mwewe's town), Unyika, Sept. 15th, 1895; Deep Bay, Feb. 11th and 24th, 1896.

64. PLEBEIUS TROCHILUS.

Lycæna trochilus, Freyer, Neuere Beitr. v. pl. 440. fig. 1 (1844).

Deep Bay, Feb. 6th, 14th, and 24th, 1896.

65. SCOLITANTIDES STELLATA.

Lycæna stellata, Trimen, Trans. Ent. Soc. London, 1883, p. 349.

Kasungu Mountain, 5400 feet alt., Nyika, March 5th, 1896.

CYCLYRIUS, gen. nov.

Nearly allied to *Hyrius*, but with rounded wings; the secondaries without tails; neuration as in *Hyreus*. Type, *Polyommatus webbianus*. This genus will contain the species *P. webbianus* and *H. æquatorialis*, hitherto referred to *Hyreus*, as well as the following:—

66. CYCLYRIUS JUNO, sp. n. (Plate XLI. fig. 5.)

Allied to *C. webbianus*, the male above lilac, bluer at base, with broad cupreous-brown costal and external borders; fringes white, spotted with brown at the extremities of the nervures; secondaries with the abdominal area somewhat greyish; an oval submarginal black ocellus with shining lilac iris on first median interspace, and indications of a second smaller similar ocellus near anal angle on interno-median interspace. Body above black, clothed with silver hair; a silvery-white line on each side of the frons, immediately in front of the eyes; collar clothed with golden hair: under surface of primaries golden brown, the markings not very distinct, but consisting of two pale-edged, quadrate, slightly darker spots crossing the discoidal cell, and a belt of similar character across the disc, its uppermost division with white outer edge and followed by a creamy white diffused subapical spot; fringe creamy white, spotted with blackish: secondaries white, speckled with blackish at the base and mottled and banded with copper-brown almost exactly in the pattern of *C. æquatorialis*; a black oval spot, enclosing a metallic green dash, representing the ocellus of the upper surface. Body below densely covered with white hair or scales, the legs brownish above, white below.—Female above cupreous brown, with fringe and ocelli as in male; under surface with brown-centred white

marginal spots, otherwise as in the male. Expanse of wings, ♂ 25 millim., ♀ 24 millim.

♂ ♂, ♀, Kasungu Mountain, 7075–7425 feet alt., Nyika, March 1st and 2nd, 1896.

67. HYREUS VIRGO.

Hyreus virgo, Butler, P. Z. S. 1896, p. 121, pl. vi. fig. 1.

♂, Kasungu Mountain, 5490 feet alt., Nyika, Feb. 29th, 1896.

68. HYREUS PALEMON.

Papilio palemon, Cramer, Pap. Exot. iv. pl. cccxc. E, F (1782).

Cheni-Cheni Mountain, 7400 feet alt., Nyika, June 30th; Mbalizi Valley, 4375 feet alt., Unyika, August 25th, 1895; Kasungu Mountain, 7425 feet alt., Nyika, March 4th, 1896.

69. URANOTHAUMA POGGEI.

Plebeius poggei, Dewitz, Nov. Act. Acad. Leop.-Carol. Nat. Cur. xli. 2, pl. xxvi. fig. 7 (1879).

♂, Lisenga, 4500 feet alt., Mbalizi Valley, Unyika, Sept. 16th, 1895.

70. URANOTHAUMA CRAWSHAYI.

Uranothauma crawshayi, Butler, P. Z. S. 1895, p. 631, pl. xxxv. figs. 6, 7.

♂ ♀, Kasungu Mountain, Sept. 2nd, 1893, March 1st, 3rd, and 5th, 1896, Nyika.

71. CAPYS CONNEXIVA, sp. n. (Plate XLI. fig. 6.)

Intermediate in character between *C. alpheus* and *C. disjunctus*; the male above dark cupreous brown, with bronze reflections; the cilia coloured as in *C. disjunctus*, with red basal line; the sericeous tawny area of the primaries much smaller than in the latter species, sometimes represented, as in *C. alpheus*, by a mere transverse belt, but more often diffused basally and occasionally forming a uniform triangular patch; secondaries with a discal patch not reaching the costa, but sometimes extended downwards to the anal tail, and occasionally an imperfect external border of sericeous tawny; below almost as in *C. disjunctus*. The female is very like that sex of the latter species on both surfaces, only the ground-colouring above is lavender, shading into brown on the outer border and into pale blue and greenish grey towards the base. Expanse of wings, ♂ 36–42 millim., ♀ 40 millim.

♂ ♂, Kasungu Mountain, 5945 feet alt., Nyika, February 29th; ♀, 5000 feet alt., March 6th, 1896.

One perfect male, four more or less worn, and a somewhat shattered female were obtained.

72. AXIOCERCES AMANGA.

Zeritis amanga, Westwood, in Oates's Matabele Land, p. 351 (1881).

♂, Mbalizi Valley, Unyika, August 25th, 1895.

73. Axiocerces perion.

Papilio perion, Cramer, Pap. Exot. iv. pl. cccl xxix. B, C (1782).

♀, Luvira River, Nyasa to Tanganyika Road, August 23rd, 1895; Deep Bay, Feb. 24th, 1896.

74. Cigaritis abbotti.

Chrysophanus abbottii, Holland, 'Entomologist,' xxv. Suppl. p. 90 (1892); Proc. Unit. States Nat. Mus. vol. xviii. p. 240, pl. vii. fig. 4 (1895).

♀, Kasungu Mountain, Nyika, March 2nd, 1896.
"Emerald-green ova" (*R. C.*).

75. Spindasis caffer.

Aphnæus caffer, Trimen, Trans. Ent. Soc. London, 1868, p. 88, and 1870, p. 368.

♂ ♀, Kondowi, Lower Nyika, Feb. 21st; ♂, Kasungu Mountain, 5395 feet alt., Nyika, Feb. 29th, 1896.
"♀, Bright green ova" (*R. C.*).

76. Spindasis homeyeri.

Aphnæus homeyeri, Dewitz, Deut. ent. Zeit. xxx. p. 429, pl. 2. figs. 5 *a–c* (1886).

♀, Kambwiyi, Lower Nyika, Nov. 29th, 1895.
"Large quantity of emerald-green ova" (*R. C.*).

77. Lachnocnema bibulus.

Hesperia bibulus, Fabricius, Ent. Syst. iii. 1, p. 307 (1793).

♂, Virauli Hill, Nyasa to Tanganyika Road, August 22nd, 1895.

78. Virachola anta.

Lycæna anta, Trimen, Trans. Ent. Soc. London, ser. 3, vol. i. p. 402 (1862).

♀, Luvira River, Nyasa to Tanganyika Road, Sept. 19th, 1895; Kondowi, 4000 feet alt., Nyika, Feb. 21st, 1896.

The example from Kondowi is somewhat aberrant, of a clear lavender, bluish towards the base, and with narrower and more defined brown borders than usual; the bands on the under surface are also narrow. The Luvira River example contained "bright green ova," according to Mr. Crawshay.

79. Rapala zela.

Hypolycæna zela, Hewitson, Ill. Diurn. Lep., Suppl. p. 14, pl. 5. figs. 41, 43 (1869).

♂, Kasungu Mountain, 5345 feet alt., Nyika, Feb. 29th, 1896.

80. Iolaus auricostalis, sp. n. (Plate XLI. fig. 7.)

♀. Nearly allied to *I. philippus*, above ash-grey; primaries with the costal margin, especially at the base, bright golden-ochreous, veins dusky, external border smoky grey, preceded by an arched increasing series of six whitish spots, edged in front with smoky

grey: a whitish annulus at external angle; secondaries nearly as in *I. philippus*, but with a much larger, more brightly orange spot above the outer tail; body blackish, head above and collar dusky orange: under surface chalky whitish, with white-edged dark grey markings tinged with orange towards the abdominal margin of secondaries; in general character these resemble the markings in *I. philippus*, but the discal interrupted line is more incurved on the primaries and more irregular (approaching that of *I. bowkeri* in form) on the secondaries; the orange spot above the outer tail is large and conspicuous. Expanse of wings 35 millim.

♀, Kasitu River, Angoni country, W. of Lake Nyasa, June 18th, 1895.

Unfortunately only a single example, slightly chipped towards the anal angle of both hind wings, was obtained.

81. Iolaus cæculus.

Iolaus cæculus, Hopffer, Ber. Verh. Ak. Berlin, 1855, p. 642; Peters' Reise nach Mossamb. v. p. 402, pl. 25. figs. 12–14 (1862).

♂ ♂, ♀ ♀, Mtambwi Hill, Deep Bay, July 1st and Dec. 1st, 1895, Jan. 6th, Feb. 20th and 22nd, 1896.

"Fairly plentiful: a frequenter of upland forest" (*R. C.*).

The Nyasa specimens seem to vary more, as regards the width of the red bands on the under surface, than those from South Africa.

82. Iolaus pallene.

Myrina pallene, Wallengren, Kongl. Svensk. Vet.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 36.

♀ ♀, Loangwa River, 2160 feet alt., Senga, August 30th, 1895.

"Bright green ova" (*R. C.*).

83. Mylothris agathina.

Papilio agathina, Cramer, Pap. Exot. iii. pl. ccxxxvii. D, E (1782).

♀, Deep Bay, Lake Nyasa, Feb. 5th, 1896.

"Enormous number of yellow ova" (*R. C.*).

84. Mylothris crawshayi.

Mylothris crawshayi, Butler, P. Z. S. 1896, p. 124, pl. vi. fig. 4.

♂ ♂, Kasungu Mountain, Nyika, 7425 feet alt., March 2nd and 3rd, 1896.

85. Nychitona alcesta.

Papilio alcesta, Cramer, Pap. Exot. iv. pl. cclxxix. A (1782).

Mpimbi plain, Upper Shiri River, March 24th and 25th, 1896.

The females contained "emerald-green ova, oblong and pointed" (*R. C.*).

86. Colias edusa.

Papilio edusa, Fabricius, Mant. Ins. ii. p. 23 (1787).

Kasungu Mountain, Nyika, Sept. 2nd, 1893; Cheni-Cheni Moun-

tain, 6500 feet June 27th, 7400 feet June 30th; Kondowi, Lower Nyika, Nov. 30th, 1895; Kasungu Mountain, 5945 feet Feb. 29th, 7425 feet March 2nd, 7200 feet March 5th, 1896.

Most of the specimens are of the ordinary European type.

87. TERIAS LEONIS.

Terias leonis, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 222, pl. v. fig. 6 (1886).

♂, Kondowi, 4000 feet alt., Nyika, Feb. 21st, 1896.

This is the first example I have seen from Central Africa.

88. TERIAS REGULARIS.

Terias regularis, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 486 (1876).

♂. Kasungu Mountain, 7425 feet alt., Nyika, March 3rd, 1896

89. TERACOLUS MUTANS.

♀. *Teracolus mutans*, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 459 (1877); ♂. P. Z. S. 1896, p. 126.

♂ ♀, Mpimbi, Upper Shiri River, March 24th and 25th, 1896. Dry-season form.

Differs in the great enlargement of the discal series of spots on the secondaries, these being salmon-buff tinted in the male, and sulphur-yellow in the female; the primaries in the latter sex are also coloured more nearly as in the male, but the salmon-buff area is washed with yellow; on the under surface the whole colouring of the male and the bands upon the yellow area of the female are deeper and redder.

♂, Mwankanka, Loangwa River, Senga, Sept. 7th, 1895; ♀, Loangwa Valley forest, Senga, August 30th, 1895.

The female contained "pale orange ova" (*R. C.*).

When describing the male of *T. mutans* I compared it with *T. vesta* (meaning the southern species usually so-called); but *T. vesta* is an Abyssinian species, identical with *T. velleda* of M. Lucas, and differs from the South-African butterfly in the much brighter colouring, with somewhat differently formed and much redder bands on the under surface of the secondaries: the southern species is only the wet-season form of *T. argillaceus*, and is *T. vesta* of Trimen (*nec* Lucas); the latter, on the under surface, is much nearer to *T. aurigineus*, whereas *T. argillaceus* is certainly the southern representative of *T. mutans*.

90. TERACOLUS AURIGINEUS, var. VENUSTUS.

Teracolus venustus, Butler, P. Z. S. 1888, p. 94.

♂ ♂, ♀ ♀, Mbalizi Valley, 4375 feet alt., Unyika, August 25th; ♂, Mwewe's town, Nyika, August 26th; ♀, Kaun Guzi, 4620 feet, Unyika, August 27th; ♂, Chuona River (Mwewe's town), Sept. 15th, 1895.

At the last-mentioned locality Mr. Crawshay speaks of this butterfly as being plentiful; yet he seems only to have captured

one male: it is the dry-season form of *T. aurigineus*, and until this collection came to hand was only represented by the typical male example from Kilima-njaro in the Museum series; nor have I seen it in any other collection.

91. TERACOLUS OPALESCENS.

♀. *Teracolus opalescens*, Butler, Ent. Month. Mag. xxiii. p. 30 (1886); ♂. P. Z. S. 1896, p. 125.

♂. Dry-season form.

On the upper surface this only differs from the male of the wet-season form in the absence of the black marginal spots to the secondaries; on the under surface, however, it differs in having the apical area and costal margin of the primaries and whole surface of secondaries flesh-pink, tinted on the costal borders and internervular folds with ochreous; the disc of the secondaries crossed by a series of brown dots. Expanse of wings 51 millim.

Bangara, W. coast of Lake Nyasa, August 18th, 1895. "If once missed, is exceedingly difficult to take" (*R. C.*).

The arrival of this example is particularly interesting to me, for it shows that my belief in the local constancy of some of the named forms of the *T. eris* group is, so far, borne out, the seasonal forms of this Eastern and Central African type being both easily separable from the more southern examples.

The type of *T. eris* was obtained at Ambukohl, in Lower Nubia, and is probably the true male of my *T. abyssinicus*, of which we only possess females: the figure agrees most closely with a male (wet-season form) received from Kilima-njaro, the orange apical spots on the primaries being short, the outer edge of the upper portion of the white area, beyond the cell, less oblique than in the southern forms, or than in *T. opalescens*, and the black costal belt of the secondaries extending on the disc to below the second subcostal branch; it, however, differs in having a small white spot near centre of outer margin of primaries, a character which may be variable. The southern forms are certainly not typical *T. eris*; nor can *T. johnstoni* be correctly called the dry-season form of the Natal examples presented to us by Mr. E. C. Buxton, inasmuch as the latter have the under surface of the wings pink, and must therefore themselves be the dry-season form of Mr. Trimen's *T. eris* (of which he says: "Underside—*Whitish or yellowish-white*") and identical with his variety A.

If, then, certain Lepidopterists prefer to regard the representative forms of *T. eris* as mere local phases of one species, the fact that each of them has its dry- and wet-season forms distinct from the others gives them at least a claim to be regarded as subspecies and to retain distinctive names.

92. TERACOLUS SUBFASCIATUS.

♂. *Teracolus subfasciatus*, Swainson, Ill. 2nd ser. iii. pl. 115 (1833).

♂, Mweniwandas, Nyasa to Tanganyika plateau, Dec. 15th, 1895. (Dry-season form.)

93. TERACOLUS REGINA.

♂ ♀. *Anthocharis regina*, Trimen, Trans. Ent. Soc. London, 3rd ser. i. p. 520 (1863).

Teracolus regina, Trimen, South Afr. Butt. ii. pl. xi. fig. 3, ♀ (1889).

♂, Loangwa Valley Pass, 4090 feet alt., Senga, August 28th; ♀, Mbalizi Valley, Unyika, Sept. 16th, 1895.

The female contained "pale yellow ova"; she was somewhat worn, having probably been long on the wing.

The receipt of these specimens, the male taken in the dry season and the female before the rains had fairly set in, is very interesting, as supporting the assertion that *T. anax* is the wet-season form of *T. regina*. The entire absence of the latter from any of the collections previously received by us from British Central Africa had led me to regard this statement with considerable doubt; but now I see no reason for rejecting it.

94. TERACOLUS PHLEGYAS.

Anthocharis phlegyas, Butler, P. Z. S. 1865, p. 431, pl. xxv. figs. 3, 3 *a* (1865).

Wet season, ♂ ♂, Deep Bay, March 9th, 1896.

Dry season, ♀ ♀, Loangwa Valley forest, August 30th, and Ntonga, Loangwa River, Senga, Sept. 13th, 1895.

After carefully studying the purple-tipped species, in relation to the question of seasonal dimorphism, I am forced to the conclusion that there is no reason for distinguishing the Eastern and Central African examples of *T. phlegyas* from those of the White Nile: they are slightly larger, but otherwise typical in both sexes.

T. phlegyas can hardly be a dry-season form of *T. imperator*, because the specimen of the male recorded above (and which is fairly typical) was obtained in the middle of the rains, whilst the females were obtained near the end of the dry season: on the other hand, we have a typical male of *T. imperator* taken in the middle of the dry season.

Furthermore, *T. imperator* cannot possibly be the *T. ione* of Godart, as assumed by my friend Trimen in his 'South African Butterflies.' Not only does the distribution of *T. imperator* render this highly improbable, but the description by M. Godart does not at all answer to it:—

T. ione.	*T. imperator.*
1. Black apical border divided obliquely by a violet band rounded externally.	1. Apical area violet, narrowly bordered with black.
2. A conspicuous black discocellular spot on the primaries.	2. A very faintly indicated discocellular dot, or none at all.
3. No transverse ray on under surface of secondaries.	3. A conspicuous oblique transverse ray on under surface of secondaries.

I do not doubt that M. Godart's description was made from a

somewhat worn example of the South-African *T. speciosus*, to which it approaches much more closely than to any other violet-tipped *Teracolus*: it is the only known species which can be accurately described as having the apical black border "divided transversely and obliquely by a violet band, very brilliant, rounded externally": it is moreover, in my opinion, worthy of consideration that Dr. Boisduval, who (in the *Pierinæ* especially) was apt to cut species very fine indeed, regarded the southern insect as typical *T. ione*, as there can be little doubt that the Doctor had examined the original type.

One fact, however, must not be lost sight of:—Mr. Trimen includes *T. jalone* in the synonymy of his *T. ione* and says that he does not consider it to be even a marked variety. Now *T. jalone* has a conspicuous discocellular spot on the primaries, and its wet-season form has no more ray on the under surface than exists in *T. speciosus*; only the apical border is conspicuously dusted with white scales, and the violet band is too close to the inner edge of the coloured apical area to be correctly spoken of as an oblique band crossing the border at apex. Mr. Trimen gives "White Nile" as the locality of my type of *T. jalone*, and that certainly was the locality on the specimen. Should not this have suggested to him the possibility of *T. jalone* being the dry-season male of *T. phlegyas*, rather than a hardly separable variation of *T. imperator*? We certainly have one or two specimens which tend to link *T. phlegyas* and *T. jalone*; and the two male examples taken on March 9th represent the spotted and unspotted types, although neither of them has the pink under surface with transverse ray of the typical dry-season form *T. jalone*.

95. TERACOLUS HILDEBRANDTI.

Callomne hildebrandtii, Staudinger, Exot. Schmett. p. 44, pl. 23 (1884–88).

♂, Mrali, west coast of Lake Nyasa, Sept. 22nd, 1895.

A dry-season form of this species, which cannot easily be confounded with any form of *T. annæ*, but must stand between the latter and *T. eupompe*.

The dry-season form differs from the (typical) wet-season form in its superior size, the scarlet instead of orange colouring and greater width of the apical patch on the primaries, the greyer basal area and the pinky yellowish apical area of primaries and ground-colour of secondaries on the under surface; the black terminations to the nervures are also almost obliterated: it comes nearest to *T. annæ*, var. *wallengreni*, but the marginal spots are too small, the colouring below too yellow, and the scarlet above too pronounced.

96. TERACOLUS ACHINE, var. GAVISA.

Anthopsyche gavisa, Wallengren, Kongl. Svensk. Vetensk.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 13.

♀, Mpimbi, Upper Shiri River, March 24th, 1896. "Pale yellow oblong ova" (*R. C.*).

97. Teracolus sipylus.

Teracolus sipylus, Swinhoe, P. Z. S. 1884, p. 444, pl. xl. fig. 11.

♂, Kondowi, 4000 feet alt., Nyika, Feb. 21st, 1896.

This is supposed to be an extreme wet-season form of *T. evenina*: Mr. Trimen's note in his 'South African Butterflies,' vol. iii. p. 128, seems somewhat contradictory. Of *T. sipylus* he says:—"The male is inseparable from the larger darker specimens of male *evenina* ...., though it is somewhat more heavily marked." I consider *T. sipylus* to be a distinct representative form.

98. Teracolus procne.

Anthopsyche procne, Wallengren, Kongl. Svensk. Vetensk.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 12.

Mpata, west of Lake Nyasa, August 2nd, 1895.

Probably only a varietal form of *T. theogene*; but both are dry-season forms, of which it is extremely likely that *TT. ocale*, *microcale*, *angolensis*, and *arethusa* are more or less localized wet-season forms.

99. Teracolus cinctus.

Teracolus cinctus, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. xii. p. 105 (1883).

Dry-season form ♂ ♀, Loangwa River, Senga, Sept. 5th and 13th, 1895.

Differs from the typical wet-season form in the reduction of the internal black streak on the primaries, which is represented by a greyish smear ending in a darker spot, and in the rosy colouring of the secondaries on the under surface.

100. Teracolus subfumosus.

Teracolus subfumosus, Butler, P. Z. S. 1876, p. 139, pl. vi. fig. 3.

♂, Loangwa River, Senga, Sept. 12th, 1895.

This is doubtless a wet-season form of some other named *Teracolus* and allied to *T. eione*: it is not at all likely to be a form of the West-African *T. antigone*, unless the latter can be linked by a perfect series of intergrades to *T. eione*, which at present I am not prepared to admit to be a fact. If *T. antigone* and *T. eione* are distinct species (as claimed in the 'South African Butterflies'), the forms from Western Africa must be kept separate from those of the South. *T. phlegetonia* is allied to *T. eione*, but does not closely agree with it in pattern, though both represent the extreme wet-season types of the country which they inhabit. In like manner, *T. xanthus* will probably prove to be a wet-season form of *T. odysseus*, inasmuch as both forms inhabit the White Nile, and are so much alike that their proper females were originally transposed; the differences between them are similar to those which exist between *T. eione* and *T. subfumosus*, or between *T. phlegetonia* and *T. antigone*. As might be expected of West Coast forms, no

extreme dry-season types seem to occur: the pattern of *T. antigone* represents the latter, but the rosy colouring on the under surface, characteristic of Southern, Eastern, and Northern types, is wanting.

101. TERACOLUS INCRETUS.

♀. *Teracolus incretus*, Butler, Ent. Month. Mag. xviii. p. 146 (1881).

♂. *Callosune vulnerata*, Staudinger, Exot. Schmett. pl. 23.

♀, Kawembi, N.W. coast of Lake Nyasa, Sept. 23rd, 1895.

102. BELENOIS THYSA, var. SABRATA.

♂. *Belenois sabrata*, Butler, Trans. Ent. Soc. London, 1870, p. 526.

♂, Mtambwi Hill, west of Lake Nyasa, Feb. 20th; ♀, Mpimbi Plain, Upper Shiri River, March 25th, 1896.

"Oblong yellow ova" (*R. C.*).

The largest specimens of the species which I have seen, and, apparently, the only form taken in Nyasa-land. It differs from typical *B. thysa* in the narrower black border at apex of primaries and the more dentate-sinuate (rather than zigzag) character of the inner edge of the outer border; the subapical spots well separated from the border, though touching the black veins in the female. The type of *B. sabrata* was an unusually small example. A very curious female of *B. thysa*, with glaucous greyish apex of primaries and ground-colour to secondaries below, was obtained on the Chuona River (Mwewe's), Unyika, August 26th, 1895.

103. ERONIA LEDA.

Dryas leda, Boisduval, Voy. de Deleg., App. p. 588 (1847).

♂, Mpimbi, Upper Shiri River, March 24th, 1896.

104. PAPILIO PSEUDONIREUS.

Papilio pseudonireus, Felder, Reise der Nov., Lep. i. p. 94 (1865).

Kasungu Mountain, 7425 feet alt., Nyika, March 1st to 4th, 1896.

105. PAPILIO PHORCAS.

♂. *Papilio phorcas*, Cramer, Pap. Exot. i. pl. ii. B, C (1775).

♂ ♂, ♀, Kasungu Mountain, 7425 feet alt., Nyika, March 1st, 1896.

"Fairly plentiful, but very difficult to take, as it flies high, skimming the trees, and rarely comes down within reach." The female contained "large spherical boiled-sago-coloured ova" (*R. C.*).

All the specimens were more or less shattered, the female with the same green bands and spots as the male; all the specimens with the subapical patch on the primaries rather smaller than in Western examples.

106. PAPILIO HORRIBILIS.

Papilio horribilis, Butler, Lep. Exot. p. 88, pl. xxxiv. fig. 2 (1872).

♂, Kasungu Mountain, 7425 feet alt., Nyika, March 1st, 1896.

"A pair only seen, floating round in the air, in an opening on the outskirts of a vast forest; spent something like half an hour in waiting to capture one; the other disappeared" (*R. C.*).

107. SARANGESA ASTRIGERA.

Sarangesa astrigera, Butler, P. Z. S. 1893, p. 669; Holland, l. c. 1896, pl. ii. fig. 8.

Fuleriva forest, Deep Bay, Feb. 28th and March 6th, 1896.

108. SARANGESA MOTOZI.

Pterygospidea motozi, Wallengren, Kongl. Svensk. Vetensk.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 53.

Virauli Hill, Nyasa to Tanganyika Road, August 22nd, 1895.

109. SARANGESA PERTUSA.

Sape pertusa, Mabille, C.R. Soc. Ent. Belg. 1891, p. lxviii.

Henga, W. of Lake Nyasa, June 26th, and Loangwa River, Senga, Sept. 5th, 1895.

"Local, frequents shady nooks, holes, and hollows" (*R. C.*).

One example nearly approaches *S. motozi* on the upper surface, but differs in the absence of yellow-ochre blotches and spots on the under surface; other specimens barely differ (if at all) from *S. synestalmenus*, Karsch.

110. SARANGESA HOLLANDI, sp. n. (Plate XLII. fig. 1.)

♂. General form of *S. pertusa*, excepting that the costa of primaries is proportionately longer, and the outer margin consequently less arched and more oblique. Above golden-bronze-brown; all the vitreous white spots small and edged with blackish: primaries with two superposed vitreous spots at basal third of interno-median areole, two near the end of discoidal cell forming a broken >, two near base of median areoles, the lower one large and irregularly diamond-shaped, two black dots below the latter, the upper one with a white central point, three subapical spots (the first very small), and below them two blackish spots; fringe buff, excepting near external angle, where it is white, varied with blackish spots at the ends of the nervures and with a slender blackish subbasal line: secondaries with a small spot at the end of the cell, almost encircled by a series of ten spots, mostly with small vitreous centres; fringe brown at apex, sordid at anal angle, otherwise white, spotted with blackish at the end of each nervure: body darker than the wings, with two white dots at each side of the head against the eyes; antennæ smoky brown. Primaries below irrorated with pale lilac; the vitreous spots white-edged and therefore apparently larger, those in the cell united so as to form a perfect >; internal border whity brown: secondaries whitish

lilac, irrorated with bronze-brown on costal area and external border almost to anal angle; vitreous spots with golden-brown margins; fringe as above: body below white, faintly lilacine at the sides of the pectus and brown at the sides of the venter. Expanse of wings 41 millim.

Mbalizi Valley, Unyika, August 25th, 1895.

This species has such a familiar aspect, that I had hoped, with the assistance of Dr. Holland's most valuable monograph, to be able to find a published name for it; but, not having done so, I have taken the liberty of dedicating it to that most energetic and painstaking Lepidopterist.

111. Tagiades flesus.

Papilio flesus, Fabricius, Spec. Ins. ii. p. 135 (1781).

Leya stream, Deep Bay, June 4th, 1895.

112. Eagris jamesoni.

Antigonus jamesoni, Sharpe, Ann. & Mag. Nat. Hist. ser. 6, vol. vi. p. 348 (1890).

Chuona River (Mwewe's town), Unyika, Sept. 14th; Lampi River, Lower Nyika, Oct. 21st, 1895.

113. Abantis (Sapæa) trimeni.

Sapœa trimeni, Butler, P. Z. S. 1895, p. 264, pl. xv. fig. 5.

Loangwa River, Senga, Sept. 10th, 1895.

I wish I could agree with Dr. Holland in thinking this identical with Westwood's species; but, as the species most nearly allied to the latter and this (*A. paradisea*) invariably has the sides of the abdomen ochreous, and the number of segments said by Westwood to be luteous does not correspond with the number of segments which are white in *A. trimeni*, I consider that, until specimens of the latter are received from the same locality as that of Westwood's type, I still have the stronger case.

114. Gorgyra johnstoni.

Aeromachus? johnstoni, Butler, P. Z. S. 1893, p. 673.

Gorgyra johnstoni, Holland, P. Z. S. 1896, p. 32, pl. ii. fig. 6.

♂, Deep Bay, Feb. 6th; ♂, ♀ taken *in coitû*, Feb. 15th, 1896.

♀. "Pale yellow ova" (*R. C.*).

The sexes are absolutely alike.

115. Oxypalpus ruso.

Pamphila ruso, Mabille, C.R. Soc. Ent. Belg. vol. xxv. p. clxxxiii (1891).

Oxypalpus ruso, Butler, P. Z. S. 1893, p. 669; Holland, l. c. 1896, p. 39, pl. iii. fig. 13.

Mtambwi Hill, Feb. 20th; Kondowi, 4000 feet alt., Nyika, Feb. 21st; Kasungu Mountain, 7425 feet alt., Nyika, March 4th, 1896.

This pretty species varies a good deal on both surfaces; the black longitudinal streak on the primaries above is frequently divided longitudinally by an ochreous median vein, and transversely by an orange-ochreous bar just before the end of the cell; the ochreous longitudinal stripe of the secondaries is sometimes expanded so as to leave only a narrow black costal border; on the under surface there is occasionally a subapical decreasing series of five cream-coloured spots divided only by the nervures (which are dull orange), and the secondaries are cream-coloured, with orange-tawny veins and internal streak: intergrades between the extremes occur.

116. Cyclopides perexcellens. (Plate XLII. fig. 2.)

Cyclopides perexcellens, Butler, Ann. & Mag. Nat. Hist. ser. 6, vol. xviii. p. 161 (1896).

Kasungu Mountain, 7425 feet alt., Nyika, March 2nd and 5th, 1896.

117. Cyclopides quadrisignatus.

Cyclopides quadrisignatus, Butler, P. Z. S. 1893, p. 670, pl. lx. fig. 9.

Kasungu Mountain, 6200 feet alt., March 1st; 7425 feet, March 2nd, 3rd, and 6th, Nyika.

Every fresh collection brings additional evidence of the variability of this species. The example obtained on March 6th has the two obliquely-placed orange spots just beyond the middle of the primaries unusually large and confluent, two small costal spots being only separated from them by the subcostal nervure. At first sight this variety might be taken for a modification of *C. midas*, but it is not only too dark, both in ground-colour and spots, but the inner of the two costal spots (which doubtless represents the basal orange dash in *C. midas*) is much too far from the base to be characteristic of that species, whilst the absence of the spot in the discoidal cell of the secondaries is characteristic of *C. quadrisignatus*.

118. Cyclopides midas.

Cyclopides midas, Butler, P. Z. S. 1893, p. 671; 1895, p. 265, pl. xv. fig. 6.

Chuona River (Mwewe's), Unyika, August 26th, 1895.

The damaged aberrant examples recorded under this species in my paper on Mr. Scott Elliot's collection prove to be extreme forms of the preceding species: I had thought it impossible that *C. quadrisignatus* could vary so much. *C. midas* is tolerably constant.

119. Gegenes letterstedti.

Hesperia letterstedti, Wallengren, Kongl. Svensk. Vetensk.-Akad. Handl. 1857, Lep. Rhop. Caffr. p. 49.

Kasungu Mountain, 7425 feet alt., Nyika, March 4th, 1896.

The only objection which I can see to *G. obumbrata* (=*hottentota*) being a form of the above species, is the presence of a well-defined brand on the primaries of the male: no trace of this brand is visible on any of our examples of either the yellowish or the smoky-brown variety of *G. letterstedti*.

120. ANDRONYMUS PHILANDER.

Pamphila philander, Hopffer, Monatsber. Akad. Wiss. Berl. 1855, p. 643; Peters' Reise nach Mossamb., Zool. v. p. 416, pl. xxvii. figs. 1. 2 (1862).

♀ ♀, Mtambwi Hill, W. of Lake Nyasa, Feb. 22nd, 1896.

"Large dark yellow ova" (*R. C.*).

I am very glad that Dr. Holland has made this the type of a new genus; it was quite out of place in *Acleros*.

HETEROCERA.

121. CEPHONODES HYLAS.

Sphinx hylas, Linnæus, Mantissa, i. p. 539 (1771).

♂ ♀, Deep Bay, Feb. 16th and March 10th, 1896.

"Frequents the beds of *Azineas* in the fort, but is not plentiful" (*R. C.*).

The female contained "bright emerald-green ova."

122. MACROGLOSSA TROCHILOIDES.

Macroglossa trochiloides, Butler, P. Z. S. 1875, p. 5.

Kasungu Mountain, 7425 feet alt., Nyika, March 4th, 1896.

A beautiful and perfectly typical example of this race.

123. BASIOTHEA IDRICUS.

Sphinx idricus, Drury, Ill. Nat. Hist. iii. pl. 2. fig. 2 (1773).

♀, Deep Bay, Feb. 18th, 1896.

"Day-flyer: emerald-green ova" (*R. C.*).

The most perfect specimen that I have seen of this tiny green-winged Hawk-moth.

124. CHÆROCAMPA ESON, var. GRACILIS.

Chærocampa gracilis, Butler, P. Z. S. 1875, p. 8, pl. ii. fig. 2.

♀, Deep Bay, Feb. 22nd, 1896.

"Light sea-green ova" (*R. C.*).

Chiefly differs from the Southern form (typical *C. eson*) in its narrower wings, with more oblique outer margin.

125. XANTHOSPILOPTERYX PERDIX.

Eusemia perdix, Druce, P. Z. S. 1887, p. 668.

Eusemia eoa, Mabille, Bull. Soc. Ent. France, 1890, p. 123; Novit. Lepid. pl. xi. fig. 1 (1892).

♀, Deep Bay, Feb. 11th, 1896.

"About as common, perhaps, as the 'Cream-spot tiger' in Great Britain. Emerald-green ova" (*R. C.*).

The first example that I have seen of this pretty species.

126. ÆGOCERA INCLUSA.

♀. *Pristocerœa*? *inclusa*, Karsch, Ent. Nachr. 1895, p. 357, Taf. ii. fig. 5.

♂, Virauli Mountain, Nyasa to Tanganyika plateau, Dec. 14th, 1895.

"Fairly plentiful" (*R. C.*).

Quite new to the Museum series: Mr. Kirby is of opinion that it is the same as *Metagarista rendalli*, Rothsch., and it is quite possible that he may be correct.

127. ÆGOCERA MENETA.

Noctua meneta, Cramer, Pap. Exot. i. pl. lxx. D (1775).

Kondowi, 4000 feet alt., Nyika, Feb. 21st, 1896.

128. CHARILINA AMABILIS.

Noctua amabilis, Drury, Ill. Exot. Ent. ii. pl. 13. fig. 3 (1773).

Deep Bay, Feb. 10th and 13th, 1896.

129. ZANA SPURCATA.

Antheua spurcata, Walker, Cat. Lep. Het. xxxi. p. 298 (1864).

♀, Mweniwanda's, Nyasa to Tanganyika plateau, Dec. 15th, 1895.

130. PHALERA LATIPENNIS, sp. n. (Plate XLII. fig. 3.)

♂. Broader in the wings than any other species of the genus; the antennæ broadly pectinated as in *P. argentifera*; the upper radial of the primaries springing from the anterior angle of the cell, instead of from the subcostal; general scheme of colouring recalling *P. flavescens*. Primaries above creamy white; base of costa sprinkled with black and brick-red scales; a band of red scales crossing the wing at about basal third and followed immediately by a band of black scales, both divided by the pale nervures; two or three ill-defined greyish and testaceous stripes across the middle of the wing; at external two-sevenths is a broad belt almost parallel to outer margin, consisting first of a subangulated oblique series of black lunules, immediately followed by a more or less lunulate brick-red stripe, somewhat blackish in the centre, and lastly by a grey band irrorated with black and separating into vague lunules towards apex; a few ill-defined submarginal spots of black scales: secondaries sericeous ochreous, veins dusty, becoming black at apex and on outer margin: head, collar, and centre of thorax brownish ochreous; antennæ black; pterygodes and metathorax white, somewhat ochreous at the sides; an oblique black bar on the front of the pterygodes; abdomen reddish ochreous, with grey dorsal patches on each segment. Wings below ochreous, the veins chiefly black beyond the middle; the primaries from beyond the

cell dusted with grey; a submarginal series of ochreous lunules; a partly zigzag dusky marginal border, interrupted on the fringe by ochreous spots: secondaries with a slender black marginal line: body below deep ochreous; tibiæ, tarsi, and venter more or less blackish. Expanse of wings 55 millim.

Luvira River, Nyasa to Tanganyika plateau, Dec. 14th, 1895.

It is possible that this species may eventually be separated from *Phalera* as the type of a new genus, but at present there does not seem sufficient evidence of the importance of the characters which differentiate it to warrant its being thus distinguished; the width of the wings and the antennal characters are not uniform in the genus, whilst the position of the upper radial is the same as in *P. sigmata*.

131. PANTOCTENIA GEMMANS.

Pantoctenia gemmans, Felder, Reise der Nov., Lep. iv. pl. lxxxii. fig. 16 (1874).

Kasungu Mountain, 7425 feet alt., Nyika, March 2nd, 1896.

132. TÆDA PRASINA. (Plate XLII. fig. 4.)

Tæda prasina, Butler, Ann. & Mag. Nat. Hist. ser. 6, vol. xviii. p. 161 (1896).

Luvira River, Nyasa to Tanganyika plateau, Dec. 14th, 1895.

SCOTINOCHROA, gen. nov.

Allied to *Cosuma*, neuration the same; antennæ longer and more uniformly pectinated; palpi totally dissimilar—much longer, falciform, the second joint long, subcylindrical, somewhat flattened internally, directed obliquely upwards, third joint half the length of the second, somewhat acuminate; tarsi of front pair of legs not fringed as in *Cosuma*, and those of the second and third pairs rather penicillated than fringed, each joint having a fairly well-defined separate flattened tuft at the back.

133. SCOTINOCHROA INCONSEQUENS, sp. n.

Primaries above vinaceous chocolate-brown, sprinkled with shining, mostly leaden-grey scales; a D-shaped spot at the end of the cell, connate with an oblique irregular band from costa near apex to inner margin, this band is narrowest and inarched at its upper extremity, widest towards the inner margin; both spot and band are mostly whity brown externally and shining leaden grey in the middle, and are bounded internally by irregular black dashes and externally by a black line; from the cell downwards the inner margin of the band is zigzag and the outer margin undulated, and followed by an abbreviated similar band, which, however, has no leaden central scales (and therefore stands out as a pale patch with undulated outer margin): secondaries pale sericeous vinaceous, showing slight greenish reflections in certain lights; the abdominal border and base of fringe sienna or golden brownish; centre of

fringe blackish, tips shining dark vinaceous: body deep chocolate-brown, sprinkled with shining leaden scales; the posterior edges of the collar and bases of the metathoracic and abdominal tufts somewhat ochreous; antennæ pale sericeous brown. Under surface of wings sericeous pale brown, darker towards costal area, somewhat vinaceous, fringes distinctly so; primaries blackish in the cell and with a glistening internal area: body below glossy vinaceous chocolate-brown, the extremities of leg-joints and the last joint of the palpi somewhat ochraceous. Expanse of wings 82 millim.

Deep Bay, Feb. 5th, 1896.

134. THYRETES PHASMA, sp. n.

♀. Very close to *T. caffra*, but easily distinguished from the fact that the hyaline triangular spot in the cell of primaries fills the upper instead of the lower angle; also the inner edge of the hyaline belt from median vein to apex is not irregular but forms a direct oblique line, the second division from the apex being much elongated backwards; the brown border of the secondaries is also narrower. Expanse of wings 37 millim.

Deep Bay, Feb. 18th, 1896.

"Pale green ova" (*R. C.*).

135. ARGINA OCELLINA.

Deiopeia ocellina, Walker, Cat. Lep. Het. ii. p. 571 (1854).

♂ ♀, Deep Bay, Feb. 27th, 1896.

"Fairly common, a day-flyer, sits on grass-stalks" (*R. C.*).

DICTENUS, gen. nov.

Allied to *Setinochroa*, of exactly the same form; but differing utterly in the character of the antennæ, which are solidly bipectinated, the pectinations widely separated and emitting short bristles: the primaries with only four branches to the subcostal vein, the fork of the united third and fourth branches being longer than in *Setinochroa* and more divergent; secondaries with the subcostal furca considerably shorter and the footstalk consequently very much longer than in that genus.

136. DICTENUS INCONSTANS, sp. n. (Plate XLII. fig. 5.)

Wings bright ochreous, the primaries with a conspicuous black spot at the end of the cell; basal half of costal border black; the remaining half sometimes black, as well as a broader outer border and narrow internal border: body black, collar, pterygodes, and metathorax clothed with ochreous hair; anal tuft ochreous: wings below nearly as above, but the secondaries with a small blackish spot at the end of the cell: body below black; tibiæ and tarsi of middle and hind legs ochreous tipped with black. Expanse of wings 20 millim.

Kasungu Mountain, 7425 feet alt., Nyika, March 2nd and 5th, 1896.

137. LEPTOSOMA APICALE.

Nyctemera apicalis, Walker, Cat. Lep. Het. ii. p. 395 (1854).

♀ ♀, Deep Bay, May 16th, 1895.
"Light yellow ova" (*R. C.*).

138. SPILOSOMA AURICINCTUM, sp. n. (Plate XLII. fig. 6.)

Nearest to *S. purum* (*Alpenus purus*), but easily distinguishable from the fact that the head and the collar are bordered at the back with bright ochreous; the primaries are more produced, the costal margin being longer and the black dots are few, small, and confined to the base and costal area; the secondaries only show three conspicuous black spots in the form of a triangle, the apex of which is represented by a spot at the end of the cell and the base by two submarginal spots; primaries below immaculate, but secondaries as above. Expanse of wings 44 millim.

♀, Fuleriva hills, 2000 feet alt., Deep Bay, March 5th, 1896.

This species and *S. purum* are strikingly unlike the other Ermine Moths from the fact that both extremities of the bright golden-ochreous black-dotted abdomen are snow-white. Our examples of *S. purum* from British East Africa show no trace of the dorsal black dots, but otherwise are typical.

139. AROA TERMINALIS.

Aroa terminalis, Walker, Cat. Lep. Het. iv. p. 794 (1854).

♂, Kondowi, 4000 feet alt., Nyika, Feb. 21st, 1896.

Walker's description, having been based upon a badly rubbed and barely recognizable specimen, is utterly useless for the identification of the species; I therefore redescribe the insect from Mr. Crawshay's beautiful male example:—Primaries above deep yellowish testaceous or bright mustard-yellow; a paler central band with widely bisinuated outer edge, expanding within the cell to enclose a conspicuous rounded blood-red spot; a pale band crossing the disc near the outer margin, its inner edge bisinuated, its outer edge correspondingly biundulated; fringe very slightly paler than the ground-colour; secondaries deep orange-ochreous with bright golden-yellow fringe; antennæ yellow, with vinaceous brown pectinations; body ochreous, deepest on the abdomen: under surface bright saffron-yellow, the primaries irrorated with smoky brown scales towards apex forming two short divergent streaks; legs hairy, lemon-yellow. Expanse of wings 33 millim.

Kondowi, 4000 feet alt., Nyika, Feb. 21st, 1896.

I believe the specimen noted (P. Z. S. 1896, p. 135) as *Lopera crocata* var.? is probably a very badly discoloured and faded example of this species.

140. AROA BISTIGMIGERA, sp. n. (Plate XLII. fig. 7.)

♂. Nearest to *A. clara*: upper surface dead golden, or dull ochraceous, suffused with vinaceous greyish; fringe deep grey;

primaries with two conspicuous black spots at the end of the cell; secondaries with a fairly broad smoky black border; body smoky black; shaft of antennæ, head, collar, shoulders, and anal tuft ochreous: wings below paler than above, primaries with a large almost semicircular subapical blackish patch from end of cell; body below ochreous, blackish at the sides. Expanse of wings 27 millim.

♂ ♂, Kondowi, 4000 feet alt., Nyika, Feb. 21st, 1896.

"Day flier" (*R. C.*).

The sexes in this genus differ so much that it would not greatly surprise me to discover that the following form was the female of *A. bistigmigera*: at the same time, as Sir George Hampson points out, the pattern is so dissimilar that it would be absurd to put the two together without trustworthy proof of their identity: then again it is just as likely that *A. ochraceata* (which we have received from Zomba) may be the female of this species, inasmuch as it often has two spots at the end of the cell of primaries, though in other respects it is utterly dissimilar.

141. Aroa charax, Druce. (Plate XLII. fig. 8.)

♀. Upper surface tawny orange with broad smoky brown outer borders, that of the primaries occupying the apical third of the wing and crossed by blackish veins (which colouring commences on the orange area); border of secondaries abruptly narrowed towards anal angle; fringes sericeous, dark grey; a conspicuous black spot at the end of each discoidal cell; primaries with narrow dusky costal margin, three small black spots across the base; antennæ and third joint of palpi black; abdomen paler than thorax, golden ochreous with a dorsal series of black spots: wings below nearly as above, no subbasal spots on the primaries: body below bright ochreous; tarsi of all the legs and tibiæ of front and middle pairs black. Expanse of wings 43 millim.

Deep Bay, April 30th, 1895.

142. Lymantria bananæ, sp. n. (Plate XLII. fig. 9.)

♂. Primaries semitransparent cream-coloured, the basal third smoky brown, bisinuated in front; costa to end of cell the same colour confluent with a constricted Y-shaped bar which crosses the end of the cell; an oblique zigzag smoky-brown line, incurved towards costa, across the disc; a marginal irregular patch of the same colour near apex, and a second at external angle, also an intermediate small triangular intermediate spot; veins, excepting from the end of the cell to the apex, partly brown and partly blackish; and all the veins as they cross the zigzag line blackish: secondaries semitransparent pale golden ochreous, more opaque and more distinctly ochreous on abdominal two-fifths: body above tawny ochraceous, palest at the extremities, somewhat vinaceous on the thorax; antennæ and tips of palpal joints black: under surface of wings immaculate; body cream-coloured, a few orange hairs on

front of pectus; sides of venter ochreous. Expanse of wings 50 millim.

Mpata, W. coast of Lake Nyasa, August 21st, 1895.

"Taken in a banana plantation" (*R. C.*).

We have a nearly allied species in the Museum collection from Old Calabar.

143. MARDARA CURVIVIRGATA.

Lælia curvivirgata, Karsch, Ent. Nachr. 1895, p. 373, Taf. iv. fig. 3.

♂, Lower Nyika, 4200 feet alt., June 30th, 1895.

This species is closely related to my *M. peculiaris* from Madagascar, but differs in the fact that the golden-brown band across the primaries runs to the apex instead of to the costal margin.

144. HIBRILDES NORAX.

Hibrildes norax, Druce, P. Z. S. 1887, p. 675.

Anengya spiritalis, Karsch, Ent. Nachr. 1895, p. 374, pl. iv. fig. 7.

♂, Mweniwanda's, Nyasa to Tanganyika Road, Dec. 22nd, 1895.

145. HIBRILDES CRAWSHAYI.

Hibrildes crawshayi, Butler, Ann. & Mag. Nat. Hist. ser. 6, vol. xviii. p. 162 (1896).

♀, Mwini-uruma's town, Nyasa to Tanganyika plateau, Dec. 17th, 1895.

It is of course possible that the sexes of *H. norax* may be utterly dissimilar in colour and pattern, and that this may prove to be its female: if so, Mr. Kirby's two new species will also be sexes.

146. PSEUDAPHELIA APOLLINARIS.

Saturnia apollinaris, Boisduval, Voy. de Deleg. ii. p. 601 (1847).

Namitembo, Zomba Mountains, March 25th, 1896.

"Huge quantity of pale yellow ova" (*R. C.*).

147. ANTHERÆA DOLABELLA.

Antheræa dolabella, Druce, P. Z. S. 1886, p. 409, pl. xxxviii. fig. 2.

♀, Kasungu Mountain, 7020 feet alt., Nyika, March 1st, 1896.

"Large spherical whitish-yellow ova" (*R. C.*).

It is unfortunate that the single example of this rare species obtained by Mr. Crawshay was a good deal worn.

148. TRIGONODES HYPPASIA.

Phalæna-Noctua hyppasia, Cramer, Pap. Exot. iii. p. 99, pl. ccl. fig. E (1782).

♀, Deep Bay, March, and Oct. 18th, 1896.

"Bright green ova" (*R. C.*).

149. PATULA WALKERI.

Patula walkeri, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xvi. p. 406.

Zambezi River, East Africa, April 16th, 1896.

Perhaps this ought to be included in the present paper, but it was not sent with the Nyasa collection.

150. ARGADESA MATERNA.

Phalæna-Noctua materna, Linnæus, Syst. Nat. ii. p. 840.

Deep Bay, Oct. 9th, 1895.

151. HÆMATORITHRA RUBRIFASCIATA.

Hæmatorithra rubrifasciata, Butler, Ann. & Mag. Nat. Hist. ser. 6, vol. xviii. p. 162 (1896).

Deep Bay, Feb. 26th, 1896[1].

152. HYRIA ANGUSTA, sp. n.

Primaries above dull vinaceous purple; a broad oblique central golden ochreous band from inner margin to above the median vein, impinged upon at its anterior extremity by a blackish spot at the end of the cell; fringe golden ochraceous, somewhat stained with dull purplish at the base: secondaries bright golden ochreous, with a black dot at the end of the cell; outer border and basal half of fringe dull vinaceous purple: body sericeous dark vinaceous greyish; shaft of antennæ silvery, slightly buffish at base: under surface of wings nearly as above, but the basi-internal area of primaries sericeous and somewhat silvery; legs and centre of venter pale buff. Expanse of wings 14 millim.

Kasungu Mountain, 7200 feet alt., Nyika, March 5th, 1896.

"Day flier" (*R. C.*).

EXPLANATION OF THE PLATES.

PLATE XLI.

Fig. 1. *Amauris crawshayi*, p. 821.
2. *Panopea heliogenes*, p. 823.
3. *Planema scalivittata*, p. 826.
4. *Alæna reticulata*, ♂, p. 827.
5. *Cyclyrius juno*, p. 830.
6. *Capys connexiva*, ♂, p. 831.
7. *Iolaus auricostalis*, ♀, p. 832.

PLATE XLII.

Fig. 1. *Sarangesa hollandii*, p. 840.
2. *Cyclopides perexcellens*, p. 842.
3. *Phalera latipennis*, p. 844.
4. *Tæda prasina*, p. 845.
5. *Dictenus inconstans*, p. 846.
6. *Spilosoma auricinctum*, p. 847.
7. *Aroa bistigmigera*, p. 847.
8. „ *charax*, p. 848.
9. *Lymantria bananæ*, p. 848.

[1] Caught by Mr. G. A. Taylor.

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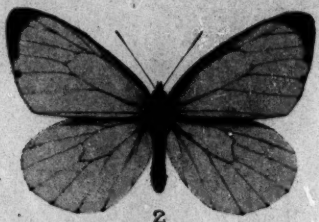

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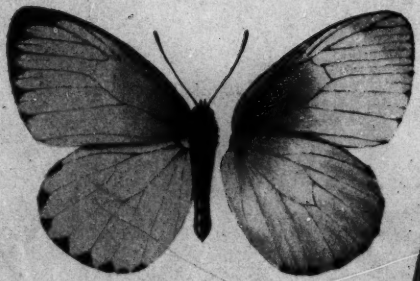

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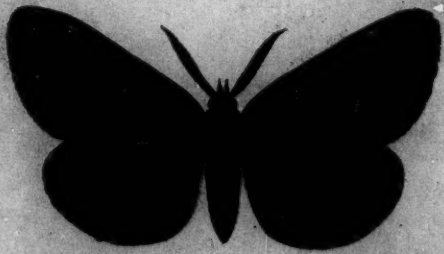

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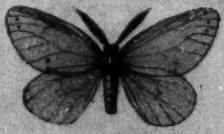

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F.C.Knight del. et lith.

West, Newman chromo.

New Lepidoptera from Nyasa-land.

Collected by Mr. Yule.

6. On a Collection of Lepidoptera from Nyasa-land presented to the Museum by Sir Harry Johnston, K.C.B., and collected by Mr. J. B. Yule.

By Arthur G. Butler, Ph.D., F.L.S., F.Z.S., Senior Assistant-Keeper, Zoological Department, British Museum.

[Received September 7, 1896.]

(Plate XLIII.)

From the few notes as to exact localities which occurred on the envelopes it would seem that the present collection was obtained partly, if not altogether, on the Songwe plain, N.W. Nyasa, in 1895; but so very few of the specimens are accompanied by notes as to locality and date of capture, that I have not thought it advisable to burden the 'Proceedings' by repeating references to descriptions and figures, most of which have already been given in other papers on Nyasa Lepidoptera published in the Society's 'Proceedings.'

The collection contains examples of five new species and of a new form of a known species; but, in addition to these, there are several species of interest, such as the wet-season form of *Ypthima granulosa*; examples of the broad-bordered variety of *Charaxes saturnus*, to which I gave the name of *laticinctus*; a somewhat worn female example of the rare *Charaxes violetta*; the white variety of *Euralia mima*; additional examples of *Metacrenis crawshayi*; a curious variety of the female of *Alæna nyassæ* having the base of the posterior wings white; both wet- and dry-season forms of *Teracolus opalescens*; the rare *Teracolus hildebrandtii*; a dry-season female of *Teracolus subfasciatus*, differing in its superior size, the larger apical orange patch on the primaries being without inner blackish limitation, and the under surface more strongly reticulated; both seasonal forms of *Teracolus emini*; the male of *Belenois diminuta*, showing that the latter is the dry-season form of *B. crawshayi*; a good series of *Papilio nivinox*, consisting entirely of males (as the only example which we possess of *P. taboranus* is a female, it seems probable that the differences in pattern and colouring between these two forms of *Papilio* are due to sex, in which case the name of *P. taboranus* will have to stand for the species); an example in good condition of a rare Hesperiid (*Cyclopides willemi*), of which the Museum previously only possessed a broken example.

Among the Moths, the most interesting additions, apart from the new species, are two male examples of *Hibrildes norax*. Respecting *Hibrildes* we know very little at present: if the female resembles the male, no examples have hitherto been received; but it is possible that the sexes may be entirely dissimilar, and that my *Hibrildes crawshayi* may eventually prove to be the female

though at present we have not the least evidence in proof of such sexual incongruity. The genus is a Pterothysanid, and the few species of that group in which the sexes are known exhibit no marked sexual differences of pattern and coloration.

The following is a list of the species in this collection :—

Rhopalocera.

1. Limnas chrysippus, *Linn.*, and var. *klugii*, Butl.
2. Tirumala petiverana, *Doubl.*
3. Melanitis solandra, *Fabr.*
4. Samanta perspicua, *Trimen.*
5. Mycalesis eusirus, *Hopff.*
6. —— ena, *Hewits.*
7. Physcænura pione, *Godm.*, * var. *lucida*, Butl.
8. Ypthima granulosa, *Butler.*
9. Charaxes castor, *Cramer*, var. *flavifasciatus*, Butl.
10. —— saturnus, *Butler*, and var. *laticinctus*, Butl.
11. —— achæmenes, *Felder.*
12. —— guderiana ♂, *Dewitz.*
13. —— phæus ♂, *Hewits.*
14. —— violetta ♀, *Grose Smith.*
15. —— tiridates ♀, *Fabr.*
16. —— bohemani, *Felder.*
17. —— candiope, *Godart.*
18. Hypolimnas misippus, *Linn.*, ♀ =*inaria*, Cram.
19. Euralia wahlbergi, *Wallgr.*
20. —— mima var., *Trimen.*
21. Junonia sesamus, *Trimen.*
22. —— simia, *Wallgr.*
23. —— galami, *Boisd.*
**24. —— elgiva, *Hewits.*
25. —— artaxia, *Hewits.*, and var. *nachtigalii*, Dewitz.
26. —— boopis, *Trimen.*
27. —— clelia, *Cramer.*
28. —— cebrene, *Trimen.*
29. —— natalica, *Felder.*
30. Protogoniomorpha anacardii, *Linn.*
31. Euphædra neophron, *Hopff.*
32. Eurypheue cocalia, *Fabr.*
33. Pseudargynnis hegemone, *Godt.*
34. Metacrenis rosa, *Hewits.*
35. —— crawshayi, *Butl.*
36. Hamanumida dædalus, *Fabr.*
37. Catuna crithea, *Drury.*
38. Neptis agatha, *Cramer.*
39. Atella columbina, *Cramer.*
40. Byblia vulgaris, *Staud.*
41. Acræa cabira, *Hopff.*
42. —— serena, *Fabr.*, var. *perrupta*, Butler.
43. —— natalica, *Boisd.*
44. Alæna nyassæ, var., *Hewits.*
45. Polyommatus bæticus, *Linn.*
46. Catochrysops osiris, *Hopff.*
47. Azanus occidentalis, *Butler.*
48. Tarucus plinius, *Fabr.*
49. Nacaduba sichela, *Wallgr.*
50. Castalius calice, *Hopff.*
51. Lycænesthes liodes, *Hewits.*
52. Zizera knysna, *Trimen.*
53. —— lucida, *Trimen.*
54. Lachnocnema bibulus, *Fabr.*
55. Spindasis nyassæ, *Butler.*
56. Virachola anta, *Trimen.*
57. Iolaus buxtoni, *Hewits.*
58. —— cæculus, *Hopff.*
59. Myrina ficedula ♀, *Trimen.*
60. Mylothris agathina, *Cramer.*
*61. —— yulei, *Butler.*
62. Terias zoe, *Hopff.*
63. —— regularis, *Butl.*
64. —— leonis, *Butl.*
65. —— orientis, *Butl.*
66. Teracolus opalescens, *Butl.*, and dry-season males.
67. —— hildebrandtii ♂, *Staud.*
68. —— subfasciatus, *Swainson*, dry-season female.
69. —— anax, *Grose Smith.*
70. —— sipylus ♂, *Swinhoe.*
71. —— omphale, *Godart.*
72. —— emini, *Butler*, dry- and wet-season forms, ♂♂.
73. Catopsilia florella, *Fabr.* Three named varieties.
74. Belenois thysa, *Hopff.*
75. —— calypso, *Drury.*
76. —— crawshayi ♂, *Butl.*, and dry-season form *diminuta* ♂.
77. —— mesentina, *Cram.*
78. —— severina ♂, *Cram.*
*79. Phrissura nyasana, *Butler.*
80. Herpænia eriphia, *Godt.*
81. Papilio policenes, *Cram.*
82. —— lurlinus, *Butler.*
83. —— porthaon, *Hewits.*
84. —— pylades, *Fabr.*
85. —— nivinox, *Butler.*
86. —— similis, *Cramer.*
87. —— demoleus, *Linn.*
88. Osmodes ranoha, *Westw.*
89. Cyclopides willemi, *Wallgr.*

HETEROCERA.

90. Chærocampa osiris, *Dalm.*
91. Daphnis nerii, *Linn.*
92. Nephele accentifera, *Beauv.*
*93. Antiphella atrinotata, *Butler.*
94. Deiopeia pulchella, *Linn.*
95. Argina leonina, *Walk.*
96. Egybolia vaillantina, *Stoll.*
97. Hibrildes norax, *Druce.*
*98. Phægorista zebra, *Butler.*
99. Acontia graellsii, *Feisth.*
100. Cyligramma latona, *Cramer.*
101. —— rudilinea, *Walk.*
*102. Fodina johnstoni, *Butler.*
103. Glyphodes sinuata, *Fabr.*
104. Gonodela zombina, *Butler.*
105. Comibæna? sp. (much rubbed; possibly *Thalassodes scissaria*, Feld.).

In this list the new forms are indicated by an asterisk; these I now proceed to describe:—

PHYSCÆNURA PIONE, var. LUCIDA. (Plate XLIII. fig. 1.)

Differs from typical *P. pione*, of which we have a good series, in the larger white area on the upper surface of the primaries, the black internal streak being abbreviated or even sometimes almost obliterated, so that the lobe extending from the white area towards inner margin is of at least double the width: on the under surface the black striæ are wider apart, far less numerous, and the yellow ocelli are paler; the three black lines on outer border are not equidistant as in typical *P. pione*, the two inner ones being nearer together. Expanse of wings, ♂ 39 millim., ♀ 45.

Two males and one female.

It is possible that this form may prove constant to locality: it is probably from near Fort Songwe, N.W. Nyasa. We have received typical *P. pione* only from Zomba and Deep Bay.

MYLOTHRIS YULEI, sp. n. (Plate XLIII. fig. 2.)

♂. Above milky white, slightly tinted with primrose-yellow at the base; apical border, a very slender marginal line, and a dot at extremity of second median branch black; costal border towards base irrorated with blackish; secondaries with black marginal dots at extremities of median branches and submedian vein: primaries below golden orange (or cadmium-yellow) to middle of cell; apical area washed diffusedly with saffron-yellowish; seven marginal black dots, the last, at extremity of first median branch, very small: secondaries creamy buff, yellower at base, the costal areolet cadmium-yellow; six black marginal spots, the smallest being the fifth from anal angle or that at extremity of radial nervure: body normal. Expanse of wings 51 millim.

The female, which I formerly supposed to be a pale variety of *M. rueppellii*, differs chiefly on the upper surface in the pale saffron flush at the base of the primaries and the still paler tint at base of secondaries: on the under surface it agrees very nearly with the male. Expanse of wings 59 millim.

The female example in the Museum is from Kilima-njaro.

PHRISSURA NYASANA, sp. n. (Plate XLIII. fig. 3.)

An exact copy of *Mylothris rueppellii*: differing chiefly in its

broader wings, the presence of the apical subcostal bifurcation, and in the form and greater intensity of the apical marginal black spots: wings above milk-white; primaries with the basal third bright cadmium-yellow bordered with gamboge; costal border irrorated with black; apical border narrowly pearl-grey, the apical furca and a series of triangular spots terminating the nervures intense black: secondaries faintly tinted with yellow at the base; a marginal series of eight intensely black spots: body normal. Primaries below white, with extreme costal margin and dots at extremities of nervures black; base almost to end of cell brilliant orange edged with yellow; apical border creamy buff: secondaries creamy buff, palest over end of cell, base suffused with orange, the costal areole brilliant orange, external border washed with deep buff; black spots as above: body whitish. Expanse of wings 64 millim.

Two males.

The following Heterocera are new:—

LIPARIDÆ.

ANTIPHELLA ATRINOTATA, sp. n. (Plate XLIII. fig. 5.)

Pearl-white, wings semitransparent; primaries with three subapical spots in a slightly curved series parallel to outer margin and two spots placed obliquely near external angle, all blackish and very small; costal margin also black, very distinctly so at basal third: antennæ pale testaceous; body of similar colouring, but densely irrorated, rather than clothed, with white scales: under surface as above. Expanse of wings 34 millim.

One male.

NYCTEMERIDÆ.

PHÆGORISTA ZEBRA, sp. n. (Plate XLIII. fig. 4.)

♂. Like *P. similis*, Walk. (= *helcitoides*, Dewitz), but the subapical patch on the black area of primaries broad and almost wholly ochreous as in *P. formosa*, the spot towards external angle also ochreous; secondaries orange-vermilion, with the usual black border and white-chequered fringe: body as in *P. similis*. Expanse of wings 71 millim.

One male.

NOCTUIDÆ.

FODINA JOHNSTONI, sp. n. (Plate XLIII. fig. 6.)

Close to *F. albicincta*, but with the primaries more closely resembling those of *F. postmaculata* in pattern, the wing being crossed as in that species by an oblique buff band ending at external angle in a greyish lobe; outer margin also buff; fringe greyish. Expanse of wings 17 millim.

One rather poor example.

This is doubtless the African representative of the Ceylonese *F. postmaculata*, from which the more buff-tinted markings of the

primaries and smoky-brown secondaries with oblique ochreous subanal line to outer margin readily distinguish it.

EXPLANATION OF PLATE XLIII.

Fig. 1. *Physcænura pione*, var. *lucida*, ♂, p. 853.
Fig. 2. *Mylothris yulei*, ♂, p. 853.
Fig. 3. *Phrissura nyasana*, ♂, p. 853.
Fig. 4. *Phægorista zebra*, ♂, p. 854.
Fig. 5. *Antiphella atrinotata*, ♂, p. 854.
Fig. 6. *Fodina johnstoni*, ♂, p. 854.

December 1, 1896.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

Mr. R. E. Holding exhibited (on behalf of Sir Robert Harvey, Bart.) the head of a three-horned Fallow Deer (*Dama vulgaris*), and pointed out in his remarks that it was a good illustration of the complete bifurcation of the entire beam of the right horn—the anterior portion carrying a small frontal tine, the second tine, and portion of the palm; while the posterior beam, starting from an independent burr at the base of the horn, carried the characteristic

Head of three-horned Fallow Deer.

back tine and a larger portion of the serrated palm: the left horn being of normal growth.

Mr. Holding also exhibited a singular case of complete symmetrical deformity in a pair of Roebuck's horns.

Mr. H. E. Dresser, at the request of Mr. Thos. Southwell of Norwich, exhibited a specimen of Pallas's Willow-Warbler (*Phylloscopus proregulus*), which he believed to be the first example of this species recorded as having been obtained in Great Britain. It had been shot at Cley-next-the-Sea, Norfolk, by the son-in-law of Mr. H. N. Pashley, on the 31st October last, who at once informed Mr. Southwell that he had a new Warbler and promised to send it to him so soon as it was dry enough. Directly he received it Mr. Southwell forwarded it on to Mr. Dresser. The scrub at Cley, the spot where it was shot, was the place which had yielded so many rare migrants, the last of which was the Aquatic Warbler, and there also Mr. Pashley had obtained this specimen.

Pallas's Willow-Warbler, though it occurred annually on the western slopes of the Ural, had only hitherto with certainty been known to occur further west on the island of Heligoland, where one was obtained in October 1845, and another was said to have been seen, but not obtained, in October 1875.

Mr. Gätke had proposed to separate the form breeding in Siberia from that breeding in the Himalayas, but Mr. Dresser, for reasons stated in his Supplement to the 'Birds of Europe,' p. 75, could not confirm this view. The present specimen, he remarked, agreed closely with an adult bird in his collection obtained at Kultuk, in Siberia, in the month of September.

The following papers were read:—

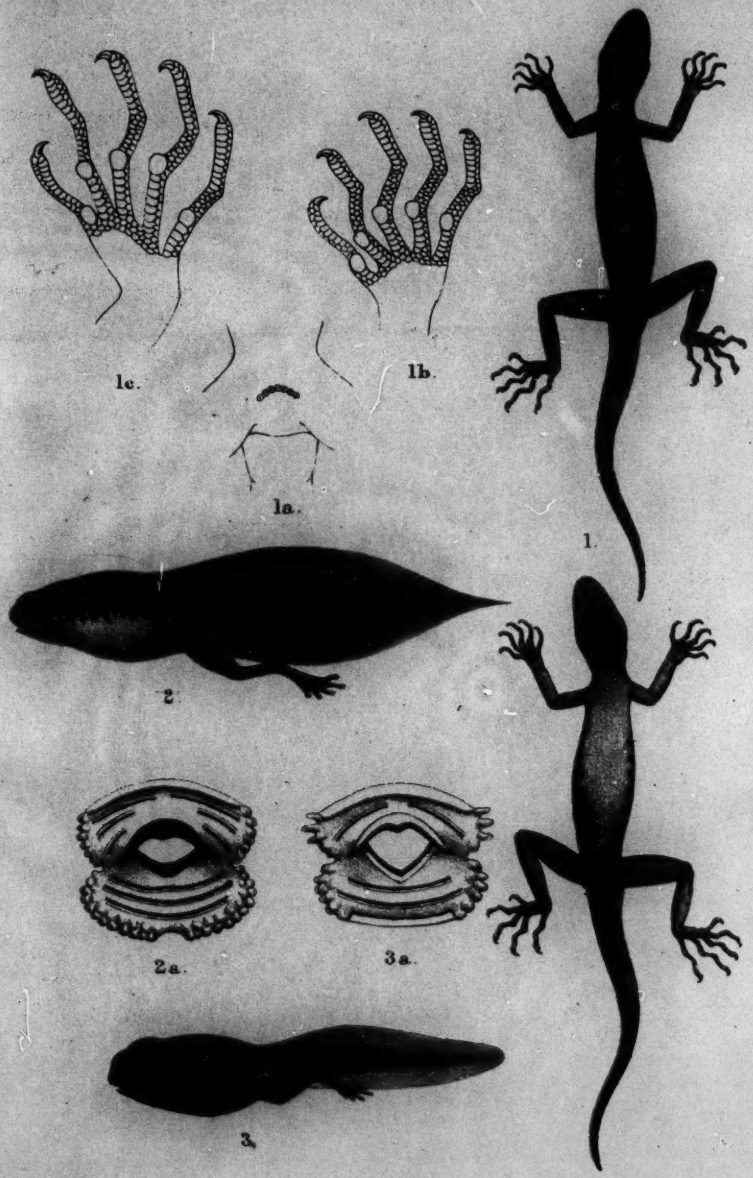
1. Notes on a Collection of Reptiles and Batrachians made in the Malay Peninsula in 1895–96; with a List of the Species recorded from that Region. By Stanley Smyth Flower, 5th Fusiliers.[1]

[Received October 15, 1896.]

(Plates XLIV.–XLVI.)

Since Dr. Cantor published his 'Catalogue of Reptiles inhabiting the Malayan Peninsula and Islands' in 1847, no general list has appeared: in his Catalogue mention is made of 106 species of Reptiles and Batrachians; in this paper 210 species are listed. Our knowledge of the herpetological fauna of Malaya since Cantor's time has been added to principally in two valuable papers by Stoliczka in the Journal of the Asiatic Society of Bengal (1870, vol. xxxix. part ii. pp. 134–228, and 1873, vol. xlii. part ii. pp. 111–126), and by collections received in the British Museum from

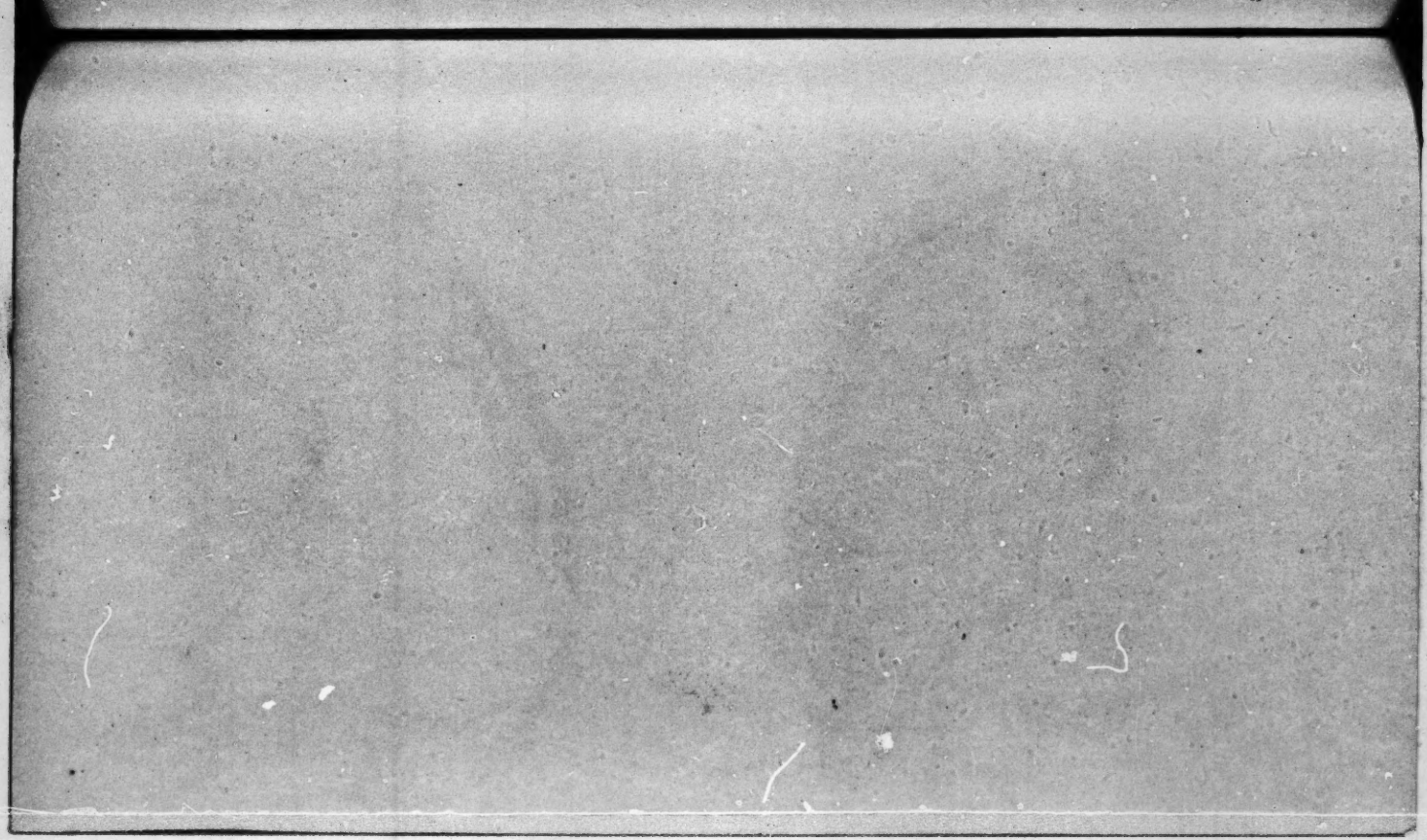
[1] Communicated by the President.

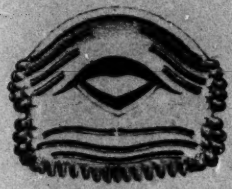


S.S.F. & J. Green del. et lith. Mintern Bros. Chromo.

MALAY REPTILES AND BATRACHIANS.

1. Gonatodes penangensis. 2. Rhacophorus leucomystax. 3. Bufo melanostictus.





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S.S.F. del. Mintern Bros. Chromo.

MALAY BATRACHIANS.

1. Rana macrodon, 2. Rana erythræa, 3. Rana labialis.

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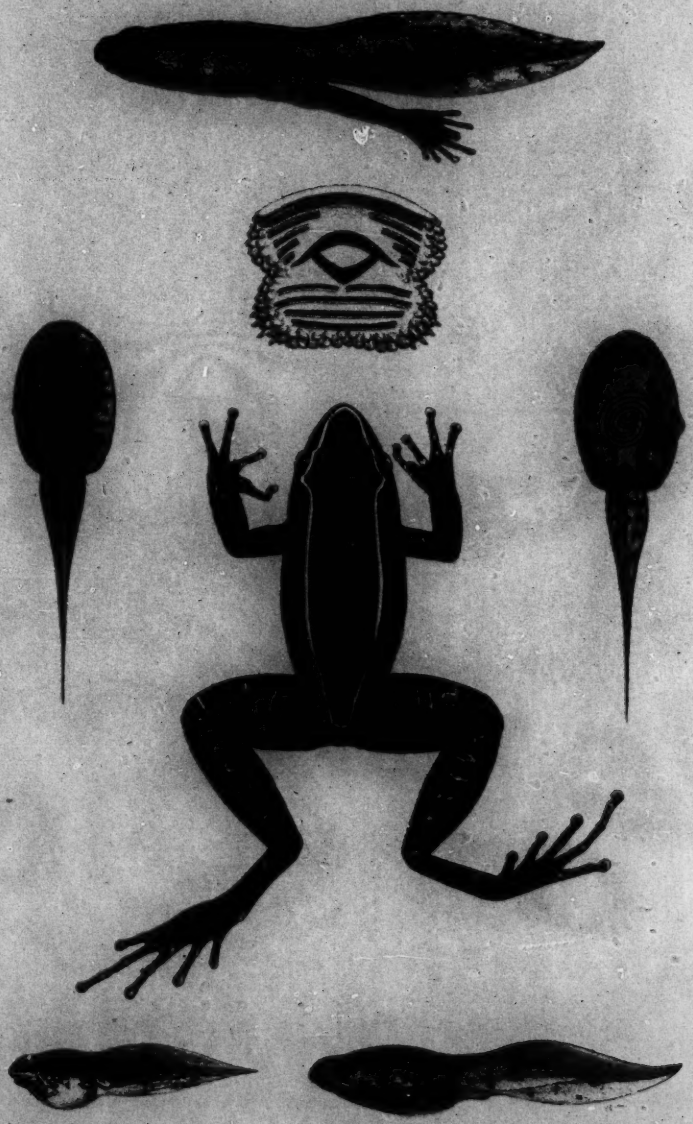

S.S.F. del.

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MALAY BATRACHIANS.

Rana luctuosa.

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Dr. N. B. Dennys, Mr. D. F. A. Hervey, Mr. H. N. Ridley, Mr. L. Wray, etc. The specimens hitherto received have nearly all been collected in the more settled localities of the Peninsula, *i. e.* Penang, Province Wellesley, Perak, Malacca, and Singapore: the States of Kedah, Kelantan, Tringanu, Pahang, Johore, etc., are practically unexplored, so that it is probable that many additions are still to be made to the number of species of Reptiles and Batrachians from Malaya. There are Museums at Taiping, Kuala Lumpur, and Singapore: the collection in the latter place I have had some opportunity for examining, but want of time did not enable me to do so as thoroughly as I could have wished; the Taiping Museum I have only paid a short visit to; the Kuala Lampur one I have not seen: there is also a large private collection of Snakes at the Prye Estate, Province Wellesley, and probably collections at other places. When all these have been thoroughly examined, we shall have a better knowledge of the relative abundance, localities, and varieties of the different species.

I have to acknowledge my sense of obligation to Mr. G. A. Boulenger for his most kind and useful advice to me both before starting to the East and in working out my collection on returning home; also to Mr. J. C. Somerville, 5th Fusiliers, and Mr. H. N. Ridley, Superintendent of the Botanical Gardens, Singapore, for assistance in collecting; I am also indebted to Mr. A. H. B. Dennys, of Penang, for a collection of Snakes made a few years ago in the Province Wellesley, and to Commissioner of Police Mitchell, of Kedah, for specimens from Kulim and neighbourhood.

In this paper the following species are recorded from the Malay Peninsula and adjacent islands for, I believe, the first time:—*Gonatodes penangensis*, sp. n., *Mimetozoon floweri*, Blgr., *Lepidodactylus ceylonensis*, Blgr., *Mabuia novemcarinata*, Anders., *Calamaria pavimentata*, Dum. & Bibr., *Rana luctuosa*, Peters, *Ixalus pictus*, Peters, and *Calophrynus pleurostigma*, Tschudi; the variations of *Rana macrodon* are discussed; and the tadpoles of four species are described.

The classification and nomenclature are according to the British Museum Catalogues of the Reptilia and Batrachia, to which valuable works I must refer for the complete synonymy of the various species mentioned; I have only quoted the names under which they appear in the standard works referred to.

Order CHELONIA.

Suborder ATHECÆ.

Family SPHARGIDÆ.

1. DERMOCHELYS CORIACEA, L.

Dermochelys coriacea, Boul. Cat. Chel. etc. p. 10 (skull fig. p. 9).

There is a large specimen, unlabelled, in the Raffles Museum, Singapore, supposed to have been caught in the neighbourhood.

Hab. Tropical seas; sometimes occurs in the temperate seas.

Suborder THECOPHORA.

Superfamily CRYPTODIRA.

Family TESTUDINIDÆ.

2. CALLAGUR PICTA, Gray.

Emys trivittata, Cantor, p. 4.
Tetraonyx affinis, part., Cantor, p. 6.
Batagur affinis, Günther, Rept. Brit. Ind. p. 40, pl. iii. fig. C.
Callagur picta, Boul. Cat. Chel. etc. p. 60.

There is a specimen in the British Museum from Penang through Cantor; from his account this species appears not to be numerous, inhabiting the coasts, rivers, and ponds of Malaya.

Hab. Malay Peninsula and Borneo.

3. BATAGUR BASKA, Gray.

Tetraonyx affinis, part., Cantor, p. 6.
Batagur baska, Günther, Rept. Brit. Ind. p. 37, pl. iii. fig. B; Boul. Cat. Chel. etc. p. 61 (skull fig. p. 62).

There is a specimen in the British Museum from the coast of Penang through Cantor.

Hab. Bengal, Burma, and Malay Peninsula.

4. HARDELLA THURGI, Gray.

Emys thurgi, Günther, Rept. Brit. Ind. p. 24.
Hardella thurgi, Boul. Cat. Chel. etc. p. 63 (skull fig. p. 64, and shell fig. p. 65).

Günther (R. B. I. p. 25) says that according to Cantor this species is found in Penang; but I do not find it mentioned in Cantor's Catalogue.

Hab. India (Indus, Ganges and tributaries), and perhaps Malay Peninsula.

5. BELLIA CRASSICOLLIS, Gray.

Emys crassicollis, Cantor, p. 3; Günther, Rept. Brit. Ind. p. 28, pl. iv. fig. E.
Bellia crassicollis, Boul. Cat. Chel. etc. p. 98 (skull fig. p. 98, and shell fig. p. 99).

Cantor says this species is numerous in the rivulets and ponds in the valleys of Penang and the Malay Peninsula. Stoliczka (J. A. S. B. 1870, vol. xxxix. part ii. p. 227) found it common in the small freshwater streams of Penang.

Hab. Tenasserim, Siam, Malay Peninsula, Sumatra, and Borneo.

6. CYCLEMYS PLATYNOTA, Gray.

Notochelys platynota, Günther, Rept. Brit. Ind. p. 17.
Cyclemys platynota, Boul. Cat. Chel. etc. p. 130.

There are five specimens in the British Museum from Singapore collected by Mr. A. R. Wallace. Cantor (p. 3) says that *Emys*

platynota inhabits the valleys of the Malay Peninsula and Penang, but is apparently not numerous; however, Günther (R. B. I. p. 18) remarks, "this was certainly an incorrect determination, as is evident from his description": I have not made out to what species Cantor's Penang Tortoise belongs.

Hab. Mergui, Malay Peninsula, Sumatra, and Borneo.

7. CYCLEMYS DHOR, Gray.

Cyclemys oldhamii, Günther, Rept. Brit. Ind. p. 15, pl. v. fig. B.
Cyclemys dhor, Boul. Cat. Chel. etc. p. 131.

It is stated in several works that this tortoise occurs in the Malay Peninsula; Dr. Gray (Cat. Shield Rept. 1855, p. 43) says that three young tortoises from Penang, described by Cantor (p. 6) as *Tetraonyx affinis*, were probably the young of this species; these specimens are now considered to belong to *Callagur picta* and *Batagur baska*.

Hab. Northern India, Burma, Siam, Camboja, Malay Peninsula and Archipelago.

8. CYCLEMYS AMBOINENSIS, Daud.

Cistudo amboinensis, Cantor, p. 5.
Cuora amboinensis, Günther, Rept. Brit. Ind. p. 12, pl. iv. figs. A, B.
Cyclemys amboinensis, Boul. Cat. Chel. etc. p. 133 (skull fig. p. 128, and shell fig. p. 129).

There are specimens in the British Museum from Malacca and Singapore. Cantor says, "This species appears to be numerous in the valleys, in ponds, rivulets and paddy fields, Malayan Peninsula and Singapore." Mr. Ridley informed me he had found it plentiful at Malacca. I found two specimens near the Ayer Etam road in Penang: the length of carapace of the larger was 198 mm.

Hab. Burma, Siam, Malay Peninsula and Archipelago, extending eastward to the Moluccas.

9. GEOEMYDA SPINOSA, Gray.

Geoemyda spinosa, part., Cantor, p. 2.
Geoemyda spinosa, Günther, Rept. Brit. Ind. p. 18; Boul. Cat. Chel. etc. p. 137.

There are specimens in the British Museum from Penang (Cantor) and from Singapore (A. R. Wallace). Mr. Ridley has found this species on Bukit Timah, Singapore. In January 1896 I found two specimens in the water, in streams on the south side of Bukit Timah, Singapore; the length of carapace of the larger was 186 mm. In captivity these tortoises spent nearly all their time in the water; they fed daily, eating for their size large quantities of fruit, preferring pineapple, but also taking orange, banana, raisins, lettuce, etc. On the 14th of May one laid an oblong, equal-ended, white egg. These specimens are now alive in the Society's Gardens (August 1896).

Hab. Tenasserim, Malay Peninsula, Sumatra, and Borneo.

10. Testudo emys, Schl. & Müll.

Geoemyda spinosa, part., Cantor, p. 2.
Manouria emys, Günther, Rept. Brit. Ind. p. 10.
Testudo emys, Boul. Cat. Chel. etc. p. 158 (skull fig. p. 150).

Cantor records this species from the Great Hill of Penang; there are two Penang specimens from him in the British Museum. In March 1896 Mr. Ridley caught a fine female specimen in the Dindings, and brought it alive to the Botanical Gardens, Singapore; the length of carapace was about 520 mm.

Hab. Assam, Burma, Siam, Malay Peninsula, Sumatra, and Borneo.

Family Chelonidæ.

11. Chelone mydas, L.

Chelonia virgata, Cantor, p. 11; Günther, Rept. Brit. Ind. p. 53.
Chelone mydas, Boul. Cat. Chel. etc. p. 180.

Cantor says, "This species is at all seasons plentifully taken in fishing-stakes in the Straits of Malacca."

Hab. Tropical and subtropical seas.

12. Chelone imbricata, L.

Chelonia imbricata, Cantor, p. 13.
Caretta squamata, Günther, Rept. Brit. Ind. p. 54.
Chelone imbricata, Boul. Cat. Chel. etc. p. 183 (skull fig. p. 181); Boul. Fauna Ind., Rept. p. 49 (young fig.).

Cantor mentions this species as inhabiting Malayan seas. Dr. Hanitsch showed me a live specimen caught near Singapore early in 1896.

Hab. Tropical and subtropical seas.

13. Thalassochelys caretta, L.

Chelonia olivacea, Cantor, p. 13.
Caouana olivacea, Günther, Rept. Brit. Ind. p. 52.
Thalassochelys caretta, Boul. Cat. Chel. etc. p. 184.

Cantor says, "This species is at Penang of rare occurrence." A specimen (now preserved in the Raffles Museum) was caught near Singapore in Jan. 1896: length of carapace 700 mm.

Hab. Tropical and subtropical seas.

Superfamily Trionychoidea.

Family Trionychidæ.

14. Trionyx subplanus, Geoffr.

Trionyx subplanus, Günther, Rept. Brit. Ind. p. 49.
Trionyx güntheri, Günther, Rept. Brit. Ind. p. 49, pl. iv. fig. 4.
Trionyx subplanus, Boul. Cat. Chel. etc. p. 246 (skull fig. p. 247).

There are specimens in the British Museum from Penang from

Dr. Cantor, and from Singapore from Gen. Hardwicke and Mr. A. R. Wallace.

Hab. Mergui, Malay Peninsula, Sumatra, Borneo, and Java.

15. TRIONYX HURUM, Gray.

Gymnopus gangeticus, Cantor, p. 8.
Trionyx gangeticus, Günther, Rept. Brit. Ind. p. 47.
Trionyx hurum, Boul. Cat. Chel. etc. p. 249; Boul. Fauna Ind. Rept. p. 13 (young figured).

Cantor says this species inhabits the rivers and sea-coasts of Penang and the Malay Peninsula, but that it is not numerous.

Hab. Ganges and Malay Peninsula.

16. TRIONYX PHAYREI, Theob.

Trionyx phayrii, Boul. Cat. Chel. etc. p. 251 (skull fig. p. 252).

Anderson (J. A. S. B. 1871, p. 30) mentions a specimen of *Trionyx phayrei*, Theobald, in the Calcutta Museum from Penang.

Hab. Burma, Malay Peninsula; Java, Borneo.

17. TRIONYX CARTILAGINEUS, Bodd.

Gymnopus cartilaginea, Cantor, p. 9.
Trionyx ornatus, Günther, Rept. Brit. Ind. p. 48, pl. iv. fig. B.
Trionyx cartilagineus, Boul. Cat. Chel. etc. p. 253 (skull figured).

There is in the British Museum a Penang specimen from Cantor; he says, "This species is numerous in rivers and ponds, Malayan Peninsula and Pinang."

Hab. Burma, Siam, Camboja, Malay Peninsula, Sumatra, Borneo, and Java.

18. PELOCHELYS CANTORIS, Gray.

Gymnopus indicus, Cantor, p. 10.
Chitra indica, Günther, Rept. Brit. Ind. p. 50, pl. vi. fig. C.
Pelochelys cantoris, Boul. Cat. Chel. etc. p. 263 (skull fig. p. 262).

The type specimen is in the British Museum from Penang from Cantor; he says it inhabits the estuaries and sea-coasts of Penang and the Malay Peninsula.

Hab. Ganges, Burma, China, Malay Peninsula, Borneo, and Philippines.

Order EMYDOSAURIA.

Family CROCODILIDÆ.

1. TOMISTOMA SCHLEGELI, S. Müll.

Tomistoma schlegelii, Boul. Cat. Chel. etc. p. 276; id. P. Z. S. 1896, p. 628.

There is a specimen in the British Museum from Pulo Tiga, Perak river, given by Mr. Wray in 1896; and there is a skull

from the Perak river in the Taiping Museum. I have heard of a third specimen from Perak and also of its being found in Pahang.

Hab. Malay Peninsula, Sumatra, and Borneo.

2. CROCODILUS POROSUS, Schn.

Crocodilus porosus, Cantor, p. 16; Günther, Rept. Brit. Ind. p. 62.
Crocodilus pondicerianus, Günther, Rept. Brit. Ind. p. 62, pl. vii.
Crocodilus porosus, Boul. Cat. Chel. etc. p. 284.

Cantor says this species is exceedingly numerous in the Malay Peninsula, Penang, and Singapore. Stoliczka (J. A. S. B. 1873, p. 113) found it in the collection he got from Penang and Province Wellesley. There are several stuffed specimens and a large skull of this species in the Raffles Museum; one shot by Mr. Owen at Serangoon, Singapore, measures 4·7 metres in total length. In April 1895 I saw many Crocodiles of this species on the Kedah river, between Kuala Kedah and Kota Star, when lying up on the mud-banks under the trees; their markings and vivid yellow and black colouring render them hard to see in the chequered light coming through the foliage. I have also seen this species on the Pandan river, Singapore. It is probably found in every suitable locality in Malaya.

Hab. India, Ceylon, Burma, Siam, Southern China, Malay Peninsula and Archipelago, New Guinea, North Australia, Solomon and Fiji Islands.

3. CROCODILUS PALUSTRIS, Less.

Crocodilus vulgarus, Cantor, p. 15.
Crocodilus palustris, Günther, Rept. Brit. Ind. p. 61, pl. vii. fig. A; Boul. Cat. Chel. etc. p. 285; id. Fauna Ind., Rept. p. 5 (skull fig. p. 2).

Cantor says that this species is numerous at Penang and on the coast of the Peninsula, but appears to be less so than *Crocodilus porosus*. There is a young specimen from Singapore in the British Museum.

Hab. India, Ceylon, Burma, Malay Peninsula and Archipelago.

Order SQUAMATA.

Suborder LACERTILIA.

Family GECKONIDÆ.

1. GYMNODACTYLUS AFFINIS, Stol.

Cyrtodactylus affinis, Stol. J. A. S. B. 1870, p. 167.
Gymnodactylus affinis, Boul. Cat. Liz. i. p. 42.

Stoliczka says, "The only specimen I caught between the bark of a large tree near the top of the Government bungalow on Penang hill;" he subsequently found it in the collection he got from Penang and Province Wellesley (J. A. S. B. 1873, p. 113).

Hab. Malay Peninsula.

2. GYMNODACTYLUS PULCHELLUS, Gray.

Gymnodactylus pulchellus, Cantor, p. 25; Boul. Cat. Liz. i. p. 46.

Cantor says, "The species appears to be rather numerous on the hills at Penang, where the individuals obtained were captured in houses, at an elevation of 2200'." Stoliczka found it in the collection he got from Penang and Province Wellesley. There are specimens in the British Museum from Singapore. I obtained three specimens on Penang Hill at an elevation of 2200 ft.; one was caught in an outbuilding, the other two in caves at night. Although so strikingly marked, they are very difficult to see in their natural surroundings, the colouring assimilates so to the irregular rocky walls of the caves. The largest specimen, ♂, was 220 mm. in total length (H.B. 113, tail 107).

Cantor's description of the life coloration is very good, but, as pointed out by Stoliczka[1], there are properly five dark bands across the neck and back (and not six). Cantor mentions these dark bands having sulphur or chrome-yellow margins, Stoliczka speaks of them as white-edged, and my specimens also had white margins. The upper surfaces of the limbs are uniform light yellowish brown, like the back; and the under surfaces of my specimens were bluish buff.

As Cantor says, they bite fiercely when handled.

Hab. Bengal to Malay Peninsula.

3. GONATODES KENDALLI, Gray.

Gonatodes kendallii, Boul. Cat. Liz. i. p. 63.

This species, for some years only known from Borneo, was found in Perak by Mr. Wray, who sent a specimen from Larut (4200') to the British Museum, and in Singapore by Mr. Ridley, who sent ♂ and ♀ specimens to the British Museum. With his assistance I obtained this species at Singapore. It is to be found during the daytime in crevices under big rocks in the jungle on Bukit Timah, and it was only by burning paper in the crevices that we could get these active little Geckos to leave their retreats.

Hab. Malay Peninsula and Borneo.

4. GONATODES PENANGENSIS, n. sp. (Plate XLIV. fig. 1.)

This species is very similar to *Gonatodes kendalli* in general appearance, but may be distinguished by the scaling of the lower side of the digits and by the presence of præanal pores in the male; in this character connecting *G. kendalli* with the species, such as *G. ornatus*, which have præanal pores.

Description.—Habit very slender. Head oval; snout broad and rounded, depressed, with the canthal ridges developed, longer than the distance between the eye and the ear-opening, nearly twice the diameter of the orbit. Eye large. Ear-opening vertically oval. Limbs long; digits long and slender, compressed. The character

[1] J. A. S. B. 1873, p. 118.

of the scales on the lower surfaces of the digits of both hands and feet at once separates this species from *G. kendalli*, in which they are entirely covered with small transverse lamellæ, while in this species, though the basal and terminal phalanges have transverse lamellæ, the intermediate one is covered with small irregular scales. There is a large oval plate at the articulation of the basal and proximal phalanges, as in *G. kendalli*. Upper surfaces covered with minute granules, intermixed on the body with irregularly arranged small tubercles, with slight keels. Rostral large, quadrangular, not twice as broad as high, with median cleft. Nostril between the rostral and several small scales. Nine to thirteen upper and nine to eleven lower labials. Symphysial very large, subtriangular. Two large chin-shields; two or three mental scales following the symphysial are slightly enlarged. Abdominal scales very small, juxtaposed, convex, keeled. Male with five to seven præanal pores, arranged in an obtusely angular or crescent-shaped line. Tail cylindrical, slender, with small keeled scales and some small pointed tubercles; but in none of the four specimens examined are there the series of large spines which are to be seen in some specimens of *G. kendalli*.

Colour (from life). Iris orange or yellow. Above yellowish brown, mottled with dark brown, deepest (rich red-dark-brown) on the shoulders. Five transverse yellow bands, two anterior very bright, three posterior more or less indistinct in some specimens; the tubercles on the two anterior yellow bands are of a most brilliant golden colour. Below, head and throat bright orange, remainder purplish-grey, shading to buff on chest and extremities of limbs. Tail with alternate bands of light and dark brown; in one specimen there are sixteen of these bands, and the tubercles on the lighter bands are white. The sexes seem to be coloured alike.

Size. The following dimensions are those of a male:—

	mm.
Total length	93
Head	12½
Width of head	7½
Body	35½
Fore limb	20
Hind limb	26
Tail	45

Females seem to be of about the same size.

Locality. I found these Geckos in March 1896, numerous in two small caves in the rocks at the "Crag," Penang, at an elevation of 2200 feet: in which they were to be found running over the walls both by day and night; at dusk they could also be found on rocks in the open. They are very active.

Four specimens, three males and one female, are now in the British Museum.

Hab. Malay Peninsula.

5. Æluroscalabotes felinus, Gthr.

Pentadactylus felinus, Günther, Rept. Brit. Ind. p. 117.
Æluros aurus felinus, Boul. Cat. Liz. i. p. 73.
Æluroscalabotes felinus, Boul. op. cit. iii. p. 482.

The type specimen in the British Museum is from Singapore.
Hab. Malay Peninsula and Borneo.

6. Hemidactylus frenatus, D. & B.

Hemidactylus frenatus, Cantor, p. 23; Stol. J. A. S. B. 1870, p. 104; Boul. Cat. Liz. i. p. 120.

Cantor says this species is "very numerous in valleys and hills; Malayan Peninsula, Pinang, and Singapore." Stoliczka says it "occurs in Penang; I only obtained it on two occasions, both times on the pillars of the verandah; it seems to have been expelled from the interior apartments by the much stronger *Peripia peronii*" (=*Gehyra mutilata*). I had not seen Stoliczka's paper when I was at Penang, but arrived at the same conclusion about the habits of this species; during a fortnight that I spent on Penang Hill last March, I noticed that while *Gehyra mutilata* swarmed in my room, the smaller *Hemidactylus frenatus* was only to be found in the outer verandah. I also found this species in Georgetown, Penang. The largest specimen I got was 106 mm. in total length (H.B. 53 mm., tail 53 mm.).
Hab. Southern India, China, Indo-China, Malay Peninsula, islands of Western Pacific and Indian Oceans and St. Helena.

7. Hemidactylus gleadovii, Murr.

Hemidactylus maculatus, part., Günther, Rept. Brit. Ind. p. 107.
Hemidactylus gleadovii, Boul. Cat. Liz. i. p. 129; id. Fauna Brit. Ind., Rept. p. 86 (figured).

Günther mentions having seen specimens from Singapore.
Hab. India, Ceylon, Burma, South China, and Malay Peninsula.

8. Hemidactylus depressus, Gray.

Hemidactylus depressus, Boul. Cat. Liz. i. p. 134.

There is a specimen from Singapore in the British Museum.
Hab. Ceylon, Malay Peninsula.

9. Hemidactylus leschenaulti, D. & B.

Hemidactylus leschenaultii, Boul. Cat. Liz. i. p. 136.

There is a specimen in the British Museum from Penang from Dr. Cantor.
Hab. India, Ceylon, Malay Peninsula.

10. Hemidactylus coctæi, D. & B.

Hemidactylus coctæi, Cantor, p. 23; Boul. Cat. Liz. i. p. 137.

Cantor observed two males in houses in the valley of Penang.
Hab. India, Malay Peninsula.

11. HEMIDACTYLUS PLATYURUS, Schn.

Nycteridium platyurus, Stol. J. A. S B. 1873, p. 113.
Nycteridium schneideri, Günther, Rep. Brit. Ind. p. 111.
Hemidactylus platyurus, Boul. Cat. Liz. i. p. 143.

Cantor observed this species in houses in the valley of Penang; Stoliczka found it in the collection he got from Penang and Province Wellesley.

Hab. India, Ceylon, South China, Indo-China, Malay Peninsula and Archipelago.

12. MIMETOZOON FLOWERI, Blgr.

Mimetozoon floweri, Boul. P. Z. S. 1896, p. 767, pl. xxxvi.

The specimen described by Mr. Boulenger I caught at dusk, running on the ground, in the garden of the "Crag" Hotel, Penang Hill, at an elevation of 2200′, in March 1896.

Hab. Malay Peninsula.

13. GEHYRA MUTILATA, Wiegm.

Hemidactylus peronii, Cantor, p. 22.
Peripia peronii, Stoliczka, J. A. S. B. 1870, p. 163.
Gehyra mutilata, Boul. Cat. Liz. i. p. 148.

Cantor observed this species in houses in the valley of Penang; and Stoliczka says it is the most common House-Gecko all over the island of Penang, along the sea-coast as well as on the top of the hill, elevation 2500′. I found this Gecko swarming in houses wherever I stayed in Penang and Singapore (also in Deli, Sumatra), and, as Stoliczka says, from the sea-level to the top of the hill: it is to be found both inside and outside buildings, and I have also found it in gardens. It is very voracious, and will attempt to seize any insect; I have more than once seen a *Gehyra* attack a full-sized *Hierodula vitrea* and repulsed. It shows great ingenuity both in escaping capture and in obtaining its food. It frequents lamps especially at night, to catch the insects attracted by the light. Whenever these Geckos are about you hear their cheerful noise, and also at intervals during the day when they are out of sight in holes or under the roof. Cantor (p. 20), in describing *Gecko monarchus*, says its cry resembles the monosyllable 'tok,' repeated 6 or 8 times with increased celerity; I have not heard the cry of *G. monarchus*, but the above description well suits that of *Gehyra mutilata*.

These Geckos throw off their tails on the slightest provocation. There was one living in the Officers' Mess at Penang, in which the reproduced tail had grown bifid laterally.

The young are very different in appearance to the adults, on account of the slenderer body and tail and the coloration. Stoliczka (J. A. S. B. 1870, p. 163) says "the young lizard is brown, with numerous rather large round pale spots all over the body;" but I have found them pale olive-brown with distinct dark brown spots above, and immaculate buff beneath. They seem to vary greatly. The spots disappear as they grow larger. The adults

have the power of changing their colour to some extent (as Cantor remarks of *Gecko monarchus*); they are generally buff or ash-coloured by day and almost white by night. From measuring a large series of specimens, I should say the total length of a full-grown average *G. mutilata* is 120 mm., of which the head and body and the tail are each about half.

Hab. Mascarene Islands, Seychelles, Ceylon, Burma, Malay Peninsula and Archipelago, New Guinea; Western Mexico.

14. LEPIDODACTYLUS CEYLONENSIS, Blgr.

Lepidodactylus ceylonensis, Boul. Cat. Liz. i. p. 164, pl. xiii. fig. 3.

This species appears not to have been previously recorded from the Straits Settlements. I caught one female in Headquarter House, Singapore. Total length 65 mm. (H.B. 36, tail 29).

Colour. Above dark brown, spotted with brick-red and black. Black lateral line from snout to shoulder passing through eye. Light yellow spots on lips and behind eyes. Upper surface of tail red with brown marks. The underpart of the body was purplish-brown, of the tail rusty-brown and yellow, with minute black spots.

Hab. Ceylon, Burma, Malay Peninsula, Borneo, Java, and Engano.

15. LEPIDODACTYLUS LUGUBRIS, D. & B.

Platydactylus lugubris, Cantor, p. 16.
Peripia cantoris, Günther, Rept. Brit. Ind. p. 110.
Lepidodactylus lugubris, Boul. Cat. Liz. i. p. 165.

Cantor says a single male was captured in his house in the valley of Penang.

Hab. Malay Peninsula and Archipelago, New Guinea, and Polynesia.

16. GECKO VERTICILLATUS, Lawr.

Platydactylus gecko, Cantor, p. 17.
Gecko guttatus, Günther and Stol.
Gecko verticillatus, Boul. Cat. Liz. i. p. 183.

There is a specimen in the British Museum from the Malay Peninsula through Dr. Cantor. Stoliczka found it in the collection he got from Penang and Province Wellesley. Müller mentions *Gecko guttatus* in the Bâle Museum from Singapore; and Dr. Blanford (P. Z. S. 1881, p. 215) mentions it in the collection he got from Dr. Dennys from Singapore and neighbouring localities.

Hab. N.E. India, Burma, Southern China, Anam, Siam, Malay Peninsula and Archipelago.

17. GECKO STENTOR, Cant.

Platydactylus stentor, Cantor, p. 18.
Gecko stentor, Günther, Rept. Brit. Ind. p. 102, pl. xi. fig. A; Boul. Cat. Liz. i. p. 184.

Cantor obtained the type specimen "from the villa on the

Pentland Hills, Penang." Stoliczka (J. A. S. B. 1873, p. 113) found it in the collection he got from Penang and Province Wellesley, and also (J. A. S. B. 1870, pp. 161, 162) mentions a specimen of *Gecko smithii* in the Fort Pit Museum said to be from Penang.

Hab. Burma, Andamans, Malay Peninsula and Archipelago.

18. GECKO MONARCHUS, D. & B.

Platydactylus monarchus, Cantor, p. 19.

Gecko monarchus, Boul. Cat. Liz. i. p. 187.

Cantor says, "In the valleys and on the hills of Penang it is very numerous, swarming at night in rooms, on the walls, and under the ceiling;" he also mentions the Malay Peninsula and Singapore as localities. Müller records this species from Singapore in the Bâle Museum. There are specimens in the British Museum from Penang and Singapore. I did not see this Gecko in Penang, but I found it common about the aviary in the Botanical Gardens, Singapore.

Hab. Ceylon, Malay Peninsula and Archipelago.

19. PTYCHOZOON HOMALOCEPHALUM, Crev.

Ptychozoon homalocephalum, Cantor, p. 20; Stol. J. A. S. B. 1870, p. 159.

Ptychozoon homalocephalum (part.), Boul. Cat. Liz. i. p. 190.

Cantor mentions two specimens captured in a villa on Penang Hill. Stoliczka says it is not uncommon in Penang, but from what I heard from inhabitants it must at any rate be rarely seen.

Hab. Burma, Malay Peninsula and Archipelago.

20. PTYCHOZOON HORSFIELDI, Gray.

Ptychozoon homalocephalum (part.), Boul. Cat. Liz. i. p. 190.

Ptychozoon horsfieldi, F. Müller, Ver. nat. Ges. Basel, 1892, p. 209, pl. iv.

The type specimen, a female, is from Singapore from General Hardwicke's collection. I caught a male on a wooden post in the Experimental Gardens, Penang Hill, 1900 ft. Total length 155 mm. (H.B. 80, tail 75). It tried to bite fiercely when handled. Both specimens are now in the British Museum.

Hab. Malay Peninsula and Archipelago.

Family AGAMIDÆ.

21. DRACO VOLANS, L.

Draco volans, Boul. Cat. Liz. i. p. 256.

Cantor gives Malayan Peninsula and Penang as localities for this species. Stoliczka says it "appears to be more common in the jungles of the Wellesley Province and near Malacca, than it is on Penang itself." Mr. Mitchell gave me two specimens caught at Kulim, Kedah. In February, March, and April of this year I found this species very numerous about Tanglin, Singapore;

males were more plentiful than females. Of over twenty specimens examined, the largest male was 200 mm. in total length (H.B. 77, tail 123), and 86 mm. in extent across its extended "wings"; and the largest female was 193 mm. in total length (H.B. 75, tail 118). Some of the females contained four rich-yellow-coloured leathery-skinned eggs about 5 by 4 mm.

Mr. Ridley found this species at the Dindings.

Life-coloration.—In Cantor's description he does not mention the differences between the male and female; in my specimens I found these both noticeable and constant.

Male. Front part of upper surface of head sea-green, with a black spot between the eyes. General colour of upper surfaces light bronze-brown, mottled all over with spots and patches of rich red-brown, dark brown, and black; in some lights fugitive metallic green shades are seen. Some of the markings are more definite than others: these are a median black spot on the nape of the neck, a cluster of black spots in front of the shoulders, two broken transverse black bands across the body, and a pair of black spots in front of hips.

Under surfaces of head, body, and limbs are brownish-buff minutely spotted with dark brown, and metallic green shades are frequent and vivid. The gular pouch is brilliant yellow.

Tail bronze-brown with rings of dark brown.

Wing-membrane—of the upper surface the portion nearest the body is of the same light bronze-brown as the back, mottled with dark brown, beyond this the ground-colour is orange-red, and the markings get larger and darker, till towards the margin they coalesce and the light ground-colour cannot be seen. Round the margin of the parachute is a narrow border of light brown speckled with black. The under surface varies from pale cobalt to bright blue, with pink patches and large bars and dots of black.

Female. Differing from the male as follows:—

(i.) Front part of upper surface of head very dark brown or grey (black spot as in male).

(ii.) The gular pouch is blue or green, minutely speckled with black.

(iii.) Where the ground-colour of the upper surface of the wing-membrane is orange-red in the male, it is rich yellow in the female.

(iv.) The under surface of the wing-membrane is greenish-yellow, there are no pink patches, and the black bars and spots are larger.

These Lizards when at rest on the trunk of a tree, usually in a vertical position, are almost invisible, owing to their dark mottled-brown colour, but when darting through the air overhead they resemble a flashing blue gem, owing to the bright colours of the underneath of the "wings." They are very active and nimble, spreading their parachute as they leap from any point, and alighting gently on all fours closing it as they touch the ground. They

can apparently direct their flight exactly. I have seen one slide through the air (with its wings quite steady) for a distance of about 20 yards, and then settle on the trunk of a tree.

Hab. Malay Peninsula and Archipelago.

22. DRACO MACULATUS, Gray.

Draco maculatus, Cantor, p. 39; Boul. Cat. Liz. i. p. 262.

Cantor obtained four specimens from the hills of Penang.

Hab. Assam, Burma, Camboja, Malay Peninsula.

23. DRACO FIMBRIATUS, Kuhl.

Draco fimbriatus, Stol. J. A. S. B. 1873, p. 119; Boul. Cat. Liz. i. p. 265.

There is a specimen from Singapore in the British Museum, and Stoliczka found a specimen in the collection he got from Penang and Province Wellesley.

Hab. Malay Peninsula and Archipelago.

24. DRACO QUINQUEFASCIATUS, Gray.

Draco quinquefasciatus, Stol. J. A. S. B. 1873, p. 118; Boul. Cat. Liz. i. p. 269, pl. xx. fig. 8.

The type specimen in the British Museum is from Penang, from Gen. Hardwicke's collection, and Stoliczka obtained one specimen in the collection he got from Penang and Province Wellesley.

Hab. Malay Peninsula and Borneo.

25. DRACO MELANOPOGON, Blgr.

Draco melanopogon, Boul. Cat. Liz. iii. p. 492.

The types are in the British Museum; they are from Malacca, presented by Mr. Hervey.

Hab. Malay Peninsula, Borneo, and Natunas.

26. APHANIOTIS FUSCA, Ptrs.

Aphaniotis fusca, Boul. Cat. Liz. i. p. 274.

There are two specimens in the British Museum from Malacca, presented by Mr. Hervey.

Hab. Malay Peninsula, Borneo, and Natunas.

27. GONYOCEPHALUS HERVEYI, Blgr.

Gonyocephalus herveyi, Boul. Cat. Liz. iii. p. 493.

The type specimen is in the British Musuem from Malacca, presented by Mr. Hervey.

Hab. Malay Peninsula and Natunas.

28. GONYOCEPHALUS BORNEENSIS, Schl.

Gonyocephalus borneensis, Boul. Cat. Liz. i. p. 288.

There are four specimens in the British Museum from Malacca, presented by Mr. Hervey.

Hab. Malay Peninsula and Borneo.

29. GONYOCEPHALUS GRANDIS, Gray.

Diplophyrus grandis, Cantor, p. 34, pl. xx.
Gonyocephalus grandis, Boul. Cat. Liz. i. p. 298.

Cantor obtained one specimen from the hills of Penang, at an elevation of 2000 feet.

Hab. Burma, Malay Peninsula, Sumatra, and Borneo.

30. ACANTHOSAURA ARMATA, Gray.

Lophyrus armatus, Cantor, p. 32.
Acanthosaura armata, Boul. Cat. Liz. i. p. 301, pl. xxii. fig. 1.

Cantor says that "two individuals were obtained from spice plantations in the valley" at Penang, and there are specimens in the British Museum from Singapore from Gen. Hardwicke's collection.

Hab. Tenasserim, Siam, Cochinchina, and Malay Peninsula.

31. CALOTES CRISTATELLUS, Kuhl.

Bronchocela cristatella, Cantor, p. 30.
Calotes cristatellus, Boul. Cat. Liz. i. p. 316.

Cantor says, "This species is very numerous in the Malayan countries both in the valleys and on the hills, Malayan Peninsula, Pinang, Singapore." Stoliczka obtained specimens from Penang and Province Wellesley, and from Singapore (*Bronchocela moluccana*). Dr. Blanford mentions it in the collection he got from Dr. Dennys from Singapore. I only obtained one specimen in Penang, but at Tanglin, Singapore, found this species very numerous; the largest male was 481 mm. in total length (H.B. 113, tail 368), the females seem to grow to nearly the same size. In one specimen caught at Tanglin, the tail at 113 mm. from the anus bifurcated, one branch being 109 mm. long from fork to tip, the other 197 mm.

As Cantor remarks about this Lizard, "the most striking feature is the great power of suddenly changing its colours." Both this species and *Calotes versicolor* are commonly called Chameleons by the English in the Straits Settlements. Among the Klings in Singapore there is a belief that these Lizards have twelve different colours, which they change during the day, a colour for every hour.

The colours I have noticed of this species are:—

(i.) Very light yellowish-green.
(ii.) Bright grass-green.
(iii.) Bright green as above with large dark-brown patches.
(iv.) Dark green, almost black.
(v.) Dark brown, almost black.
(vi.) Dull grey-brown.

The brighter green colours are generally uniform; but the other

colours are on the neck, back, and sides irregularly spotted or reticulated with darker; or else there are dark bands longitudinal on the neck and transverse on the body; while the limbs and tail are usually marked with transverse dark brown irregular bands.

In April the lips, cheeks, and throat of the males were very beautiful with golden, red, and crimson shades on the scales.

Both this species and *C. versicolor* seem of similar habits, liking bright sunshine and frequenting gardens and cultivated open land with small bushes, darting about the grass and climbing the branches with the utmost agility. When caught they try to defend themselves by biting fiercely.

Hab. Tenasserim, Malay Peninsula and Archipelago.

32. CALOTES VERSICOLOR, Daud.

Calotes versicolor, Boul. Cat. Liz. i. p. 321, & Fauna Brit. Ind., Rept. p. 135, fig. p. 136.

Neither Cantor nor Stoliczka seem to have observed this species in the Malay countries. F. Müller records it from Penang in the Bâle Museum, and Blanford mentions it in the collection he got from Dr. Dennys from Singapore and neighbouring localities.

I found this species fairly common about the Sepoy Lines, Penang; a female caught in March contained seven white leathery-skinned eggs, and one caught in April contained eight. In the newly-cleared country around Kulim, Kedah, there were large numbers of *Calotes*; when the jungle has been cut down, stumps of the larger forest trees are left standing here and there, several yards high out of the ground; on a bright sunshiny day, a *Calotes* was to be seen on the summit of nearly every one of these stumps, apparently enjoying the warmth and waiting for passing insects. The only specimen I obtained here was of this species.

Hab. Afghanistan, Beloochistan, India, Ceylon, Burma, Southern China, Siam, and the Malay Peninsula.

33. LIOLEPIS BELLII, Gray.

Liolepis bellii, Cantor, p. 41; Boul. Cat. Liz. i. p. 403.

There are specimens in the British Museum from Penang, from Cantor and Capt. Stafford. Cantor says, "This species appears to be numerous, but local. Twelve were at one time obtained from a spice plantation in Province Wellesley."

Hab. Southern India, Burma, Southern China, Siam, and Malay Peninsula.

Family VARANIDÆ.

34. VARANUS FLAVESCENS, Gray.

Varanus flavescens, Cantor, p. 28; Günther, Rept. Brit. Ind. p. 65, pl. ix. fig. A; Boul. Cat. Liz. ii. p. 309.

Cantor obtained a single specimen at Penang.

Hab. Northern India, Burma, Malay Peninsula.

35. VARANUS NEBULOSUS, Gray.

Varanus nebulosus, Cantor, p. 27; Günther, Rept. Brit. Ind. p. 66, pl. ix. fig. D; Boul. Cat. Liz. ii. p. 311.

Cantor obtained one specimen in the hills of Penang; there are in the British Museum three specimens from Malacca from Mr. Hervey.

Hab. Bengal, Burma, Siam, and Malay Peninsula.

36. VARANUS RUDICOLLIS, Gray.

Varanus rudicollis, Boul. Cat. Liz. ii. p. 313.

There is a specimen in the British Museum from Malacca from Mr. Hervey.

Hab. Malay Peninsula, Borneo, Philippines.

37. VARANUS SALVATOR, Laur.

Hydrosaurus salvator, Günther, Rept. Brit. Ind. p. 67, pl. ix. fig. E.

Varanus salvator, Cantor, p. 29; Boul. Cat. Liz. ii. p. 314; Boul. Fauna Brit. Ind., Rept. p. 166 (head fig. p. 162).

Cantor says, "This species is very numerous both in hilly and marshy localities; Malayan Peninsula and Pinang." Stoliczka found it in the collection he got from Penang and Province Wellesley. Dr. Blanford found it in the collection he got from Dr. Dennys from Singapore. I saw many of these Lizards on the Kedah river in April 1895, and obtained one from Blakan Mati, Singapore, in January 1896. The English in India and the Straits Settlements call them "Iguana," and the Malays "Beyawh." The Chinese prize them highly for the supposed medicinal properties of the heart, liver, etc. These Lizards are generally infested with ticks, much resembling one of their scales in size and colour. A great part of their food seems to consist of the small crabs which abound on the mud of the mangrove swamps. In life they are very handsomely marked—black and bright yellow. The largest specimen obtained I shot in the Gunong Gajah tributary of the Kedah river. It was a male—Total length 2362 mm.; head and body 1041; tail 1321; girth behind forearms 470; girth round stomach 584. It is now mounted in the Reptile Gallery of the British Museum.

Hab. Nepaul, Ceylon, China, Siam, Tenasserim, Malay Peninsula and Archipelago, Cape York.

Family SCINCIDÆ.

38. MABUIA NOVEMCARINATA, And.

Mabuia novemcarinata, Boul. Cat. Liz. iii. p. 179.

This species was discovered by Dr. Anderson in Burma. It can now be added to the list of Malayan reptiles, as I caught a specimen near "the Crag," Penang Hill, elevation 2200 ft., in March

1896. The colour of the upper parts was bronze, a black band along each side, and the belly pale green. Total length 205 mm. (H.B. 92, tail 113).

Hab. Burma, Malay Peninsula.

39. MABUIA MULTIFASCIATA, Kuhl.

Euprepes rufescens, Cantor, p. 46.
Tiliqua carinata, part., Stol. J. A. S. B. 1870, p. 169.
Mabouia multifasciata, Boul. Cat. Liz. iii. p. 186.

Cantor says it is "exceedingly numerous in the hills and valleys of the Malayan countries. Peninsula, Pinang, and Singapore." Stoliczka found it common at Penang and on the coast of Province Wellesley. This species is very common about Georgetown, Penang, especially when the sun comes out after heavy rain, large numbers are to be seen in the grass and on the stone edges of the surface drains, enjoying the warmth and showing off their brilliant metallic colours. I obtained several specimens at Singapore, but did not see it in the same abundance as at Penang. They vary a good deal in colour, but the most usual variety has the upper parts uniform olive-brown or bronze, and the lower parts pale greenish-yellow, with on either side a broad red stripe starting from above and behind the tympanum, and continuing either halfway down the body or to the hip; this stripe is highly iridescent, and changes to gold, orange, crimson, and green as the light plays on the living animal. The largest specimen obtained (from Singapore) was 314 mm. in total length (H.B. 111, tail 203).

Hab. Eastern Himalayas, Burma, Siam, Malay Peninsula and Archipelago.

40. LYGOSOMA ANOMALOPUS, Blgr.

Lygosoma anomalopus, Boul. P. Z. S. 1890, p. 84, pl. xi. fig. 4.

There are two specimens in the British Museum from Dr. J. G. Fischer from Penang.

Hab. Malay Peninsula and Sumatra.

41. LYGOSOMA OLIVACEUM, Gray.

Euprepis ernestii, Cantor, p. 47.
Lygosoma olivaceum, Boul. Cat. Liz. iii. p. 251.

Cantor mentions this species from the Peninsula and Penang. Stoliczka found it in the collection he got from Penang and Province Wellesley.

The young of this species is very brightly coloured, as mentioned by Cantor (p. 48) and by Stoliczka (J. A. S. B. 1873, p. 118). Although the general scheme of marking is the same, individuals apparently vary, so, to compare with the above accounts, I give the colours of a specimen caught by Mr. Ridley in a cocoanut tree at Galang, Singapore, last April. The length of head and

body was 32 mm., and the tail (of which the tip was broken) 36 mm. The upper surface of head was light brown, the scales being edged with black lines. A black line through eye. Lips and chin immaculate black. The back, sides, and upper surfaces of the limbs were black, with wavy, irregular but well-defined transverse lines, pale greenish-white anteriorly, gradually getting yellowish further back till those across the base of the tail were yellowish-red. The lower surfaces of the body and limbs were greenish-white. The lower surfaces of the toes and palms of feet were brown. The tail was bright red, paler beneath.

Hab. Tenasserim, Nicobars, Malay Peninsula and Archipelago.

42. LYGOSOMA SINGAPORENSE, Stdr.

Eumeces (*Mabouya*) *singaporensis*, Steindachn. Sitzb. Ak. Wien, lxii. i. 1870, p. 341, pl. iv. fig. 2.

Lygosoma singaporense, Boul. Cat. Liz. iii. p. 297.

Steindachner described this species from a specimen from Singapore.

Hab. Malay Peninsula.

43. LYGOSOMA JERDONIANUM, Stol.

Mabouya jerdoniana, Stol. J. A. S. B. 1870, p. 172.

Lygosoma jerdonianum, Boul. Cat. Liz. iii. p. 300.

Stoliczka caught the type specimen and saw others on the little island of Pulo Tikus, Penang, and mentions having observed a very similar, or the same species on one of the small islands near Singapore.

Hab. Malay Peninsula.

44. LYGOSOMA BOWRINGII, Gthr.

Eumeces bowringii, Günther, Rept. Brit. India, p. 91.

Euprepes (*Riopa*) *punctatostriatus*, Peters, Mon. Berl. Ac. 1871, p. 31.

Lygosoma bowringii, Boul. Cat. Liz. iii. p. 308, pl. xxiii. fig. 3.

Peters records a specimen from Singapore.

Hab. Burma, Hongkong, and Malay Peninsula.

45. LYGOSOMA ALBOPUNCTATUM, Gray.

Eumeces punctatus, Cantor, p. 45.

Riopa albopunctata, Stoliczka.

Lygosoma albopunctatum, Boul. Cat. Liz. iii. p. 309.

Cantor says, it "is numerous in the Malayan countries, both on hills and in valleys. Peninsula, Pinang, and Singapore." Stoliczka found it in the collection he got from Penang and Province Wellesley.

Hab. India, Assam, Burma, and Malay Peninsula.

46. LYGOSOMA CHALCIDES, L.

Lygosoma chalcides, Cantor, p. 49; Boul. Cat. Liz. iii. p. 340.

Cantor obtained two specimens on Penang Hill, and mentions a third from Singapore in the Museum of the Asiatic Society.

Hab. Southern China, Siam, Malay Peninsula, and Java.

NOTE.—In the collection sent by Dr. Dennys from Singapore, and described by Dr. Blanford (P. Z. S. 1881, p. 215), occurs *Eumeces chinensis*; but as these specimens were from the Raffles Museum, and their locality not known, it probably was not caught in the Malayan countries, but brought from China.

Suborder OPHIDIA.

Family TYPHLOPIDÆ.

1. TYPHLOPS LINEATUS, Boie.

Pilidion lineatum, Cantor, p. 50.

Typhlina lineata, Günth. Rep. Brit. Ind. p. 171, pl. xvi. fig. B.

Typhlops lineatus, Boul. Cat. Snakes, i. p. 15.

I obtained one specimen on Penang Hill, 2200 feet. Cantor mentions it from the hills of Penang, and there are specimens in the British Museum from Singapore and Malacca.

Hab. Malay Peninsula and Archipelago.

2. TYPHLOPS BRAMINUS, Daud.

Typhlops braminus, Cantor, p. 52; Günth. Rept. Brit. Ind. p. 175, pl. xvi. fig. 1; Stol. J. A. S. B. 1873, p. 114; Boul. Cat. Snakes, i. p. 16.

I obtained one specimen on Penang Hill, 2200 ft. Cantor says it is "numerous in hills and valleys, Pinang, Singapore, Malayan Peninsula." Stoliczka found it in the collection he got from Penang and the Province Wellesley. Mr. Ridley has found it at Singapore.

Hab. South Asia; islands of the Indian Ocean; Africa south of the Equator.

3. TYPHLOPS BOTHRIORHYNCHUS, Gthr.

Typhlops bothriorhynchus, Günth. Rept. Brit. Ind. p. 174, pl. xvi. fig. G; Boul. Cat. Snakes, i. p. 23.

The type specimen is in the British Museum from Penang, from Dr. Cantor.

Hab. Northern India (North-West Provinces and Assam) and Malay Peninsula.

4. TYPHLOPS NIGROALBUS, D. & B.

Typhlops nigroalbus, Cantor, p. 51; Günth. Rept. Brit. Ind. p. 172, pl. xvi. fig. F; Stol. J. A. S. B. 1873, p. 114; Boul. Cat. Snakes, i. p. 24.

I obtained one specimen on Penang Hill, 2200 ft. Length

136 mm. Colour, upper parts black, highly iridescent, lower parts pinky-grey.

Cantor found two specimens on Penang Hill; Stoliczka found it in the collection he got from Penang and Province Wellesley; and there are specimens in the British Museum from Perak and Singapore.

Hab. Malay Peninsula and Sumatra.

Family Boidæ.

5. Python reticulatus, Schn.

Python reticulatus, Cantor, p. 55; Stol. J. A. S. B. 1873, p. 115; Boul. Cat. Snakes, i. p. 85.

Cantor says this species is "very numerous in the Malayan hills and valleys"; Stoliczka found it in the collection he got from Penang and Province Wellesley, and there are specimens in the British Museum from Penang and Singapore. I have seen specimens recently caught in Penang, on the Krean river (Prov. Wellesley), and near Taiping, Perak.

Hab. Burma, Indo-China, Malay Peninsula and Archipelago.

6. Python molurus, L.

Python molurus, Stol. J. A. S. B. 1870, p. 205; Boul. Cat. Snakes, i. p. 87.

Stoliczka mentions having "seen several specimens obtained in the Wellesley province."

Hab. India, Ceylon, Southern China, Malay Peninsula, and Java.

7. Python curtus, Schl.

Python curtus, Boul. Cat. Snakes, i. p. 89, and P. Z. S. 1889, pl. xlv.

There are specimens in the British Museum from Malacca and Singapore.

Hab. Malay Peninsula, Sumatra, and Borneo.

Family Ilysiidæ.

8. Cylindrophis rufus, Lawr.

Cylindrophis rufus, Cantor, p. 53; Stol. J. A. S. B. 1873, p. 114; Boul. Cat. Snakes, i. p. 135.

I obtained one specimen at Tanglin, Singapore. Length 483 mm. Scales in 21 rows. Colour, uniform black above, belly black with transverse white bands, orange collar-mark on neck, bright vermilion mark on tail. A second specimen obtained in Singapore was 546 mm. in length. Cantor mentions one specimen from Singapore. Stoliczka found it in the collection he got from Penang and Province Wellesley, and there are specimens in the British Museum from Penang and Singapore.

Hab. Burma and Cochinchina to the Malay Peninsula and Archipelago.

9. CYLINDROPHIS LINEATUS, Blanf.

Cylindrophis lineatus, Blanford, P. Z. S. 1881, p. 217, pl. xx.; Boul. Cat. Snakes, i. p. 137.

The type specimen, from Singapore, belonging to the Raffles Museum, was described by Mr. Blanford in 1881.

Hab. Malay Peninsula.

Family XENOPELTIDÆ.

10. XENOPELTIS UNICOLOR, Reinw.

Xenopeltis unicolor, Cantor, p. 54; Peters, Monatsb. Ak. der Wiss. zu Berlin, 1859, p. 269; Boul. Cat. Snakes, i. p. 168 (skull figured).

Cantor mentions this species from Penang Hill, Province Wellesley, and Singapore; there is a specimen in the British Museum from Singapore from Dr. Dennys. Peters mentions a specimen from Princess Hill, Singapore. Of two specimens observed by me in Singapore, the first, from Tanjong Katong, had ventrals 188, subcaudals 34, and was 444 mm. in length; the second, from Tanglin, had ventrals 175, subcaudals 34, and was 875 mm. in length.

Hab. Southern India, Burma, Indo-China, Malay Peninsula and Archipelago.

Family COLUBRIDÆ.

Series **Aglypha.**

Subfamily ACROCHORDINÆ.

11. ACROCHORDUS JAVANICUS, Hornst.

Acrochordus javanicus, Cantor, p. 58; Boul. Cat. Snakes, i. p. 173.

Cantor mentions this species from Penang Hill and Singapore.

Hab. Malay Peninsula, Java, and New Guinea.

12. CHERSYDRUS GRANULATUS, Schn.

Acrochordus granulatus, Cantor, p. 59.

Chersydrus granulatus, Boul. Cat. Snakes, i. p. 174.

There is a specimen in the British Museum from Penang from Dr. Cantor, and one from Singapore from Gen. Hardwicke.

Hab. From Southern India and Cochinchina to New Guinea.

13. XENODERMUS JAVANICUS, Reinh.

Xenodermus javanicus, Boul. Cat. Snakes, i. p. 175.

"Our collection contains also a specimen from Penang."—F. Müller, Verh. nat. Ges. Basel, 1887, p. 268.

Hab. Malay Peninsula, Sumatra, Java.

Subfamily Colubrinæ.

14. Polyodontophis geminatus, Boie.

Herpetodryas prionotus, Cantor, P. Z. S. 1839, p. 52.
Ablabes melanocephalus, Günther, R. B. I. p. 229.
Polyodontophis geminatus, Boul. Cat. Snakes, i. p. 185.

Cantor mentions a specimen from Malacca. Stoliczka[1] found one example in the Botanical Gardens at Singapore, and there are specimens in the British Museum from Singapore from General Hardwicke and Dr. Dennys.

Hab. Siam, Malay Peninsula, Sumatra, Java, and Borneo.

15. Polyodontophis sagittarius, Cant.

Calamaria sagittaria, Cantor, p. 64.
Polyodontophis sagittarius, Boul. Cat. Snakes, i. p. 187.

Cantor mentions one specimen from the Malay Peninsula.

Hab. West Himalayas, Bengal, Assam, Malay Peninsula.

16. Xenochrophis cerasogaster, Cant.

Tropidonotus cerasogaster, Cantor, p. 92.
Xenochrophis cerasogaster, Boul. Cat. Snakes, i. p. 191.

Cantor mentions one specimen from the Province Wellesley.

Hab. Bengal, Assam, Khasi Hills, and Malay Peninsula.

17. Tropidonotus trianguligerus, Boie.

Tropidonotus umbratus, part., Cantor, p. 89.
Tropidonotus trianguligerus, Boul. Cat. Snakes, i. p. 224.

Stoliczka found this Snake in the collection he got from Penang and Province Wellesley, and there are specimens in the British Museum from Penang and Singapore.

Hab. Southern Burma, Malay Peninsula, Sumatra, Borneo, Java, and Ternate.

18. Tropidonotus piscator, Schn.

Tropidonotus umbratus, part., Cantor, p. 89.
Tropidonotus piscator, Boul. Cat. Snakes, i. p. 230.

Stoliczka found this Snake (*T. quincunctiatus*) in the collection he got from Penang and Province Wellesley.

Var. A. There is a specimen in the British Museum from Singapore.

Var. B. There is a specimen in the British Museum from Penang from Dr. Cantor. I obtained one specimen from the Racecourse, Penang. Ventrals 125; subcaudals 77.

Hab. India, Burma, Southern China, Indo-China, Malay Peninsula and Archipelago.

[1] J. A. S. B. xxxix. part ii. 1870, p. 183.

19. TROPIDONOTUS STOLATUS, L.

Tropidonotus stolatus, Cantor, p. 90; Boul. Cat. Snakes, i. p. 253.

Cantor mentions this species from the Malay Peninsula; and there is a specimen in the British Museum from Singapore from Dr. Dennys.

Hab. India, Ceylon, Burma, China, Malay Peninsula, and Philippine Islands.

20. TROPIDONOTUS VITTATUS, L.

Tropidonotus vittatus, Boul. Cat. Snakes, i. p. 255.

Stoliczka mentions *T. vittatus* (Günther's 'Colubrine Snakes') as occurring in the collection he got from Penang and Province Wellesley.

Hab. Malay Peninsula, Java, Celebes.

21. TROPIDONOTUS SUBMINIATUS, Schl.

Tropidonotus subminiatus, Boul. Cat. Snakes, i. p. 256.

This Snake is said to be found in the Malay Peninsula, and as it is recorded from Tenasserim and Java it seems probable.

Hab. From the Eastern Himalayas, Assam, Burma, and Southern China to the Malay Peninsula and Archipelago.

22. TROPIDONOTUS CHRYSARGUS, Schl.

Tropidonotus junceus, Cantor, p. 93.

Tropidonotus chrysargus, Boul. Cat. Snakes, i. p. 258.

There are specimens in the British Museum from Penang Hill from Dr. Cantor, and from Perak (hills over 3000 feet) from Mr. Wray.

Hab. From the Eastern Himalayas, Assam, Burma, and Southern China to the Malay Peninsula and Archipelago.

23. TROPIDONOTUS MACULATUS, Edel.

Tropidonotus maculatus, Boul. Cat. Snakes, i. p. 260.

There is a specimen in the British Museum from Malacca from Mr. Hervey.

Hab. Malay Peninsula, Sumatra, and Borneo.

24. MACROPISTHODON FLAVICEPS, D. & B.

Macropisthodon flaviceps, Boul. Cat. Snakes, i. p. 266.

There are two specimens in the British Museum from Perak from Mr. Wray.

Hab. Malay Peninsula, Sumatra, and Borneo.

25. MACROPISTHODON RHODOMELAS, Boie.

Macropisthodon rhodomelas, Boul. Cat. Snakes, i. p. 266.

There are several specimens in the British Museum from Singapore, where this Snake is very common. Between January and April 1896 I came across about fifteen specimens around

Tanglin, Singapore, mostly found in short grass and among low bushes; the largest was 609 mm. in length.

Hab. Malay Peninsula, Sumatra, Borneo, and Java.

26. HELICOPS SCHISTOSUS, Daud.

Tropidonotus schistosus, Cantor, p. 91.
Helicops schistosus, Boul. Cat. Snakes, i. p. 274.

Cantor mentions this species from the Malay Peninsula.

Hab. Southern India, Ceylon, Bengal, Burma, Yunnan, and Malay Peninsula.

27. LYCODON AULICUS, L.

Lycodon aulicus, part., Cantor, p. 68; Blanford, P. Z. S. 1881, p. 215; Boul. Cat. Snakes, i. p. 352.

Cantor mentions this species from Penang and the Malay Peninsula; Stoliczka found it in the collection he got from Penang and Province Wellesley; and Blanford mentions it from Singapore.

Hab. India, Ceylon, Himalayas, Burma, Siam, Cochinchina, Malay Peninsula and Archipelago.

28. LYCODON EFFRENIS, Cant.

Lycodon effrenis, Cantor, p. 70, pl. xl. fig. 2; Boul. Cat. Snakes, i. p. 356.

Cantor obtained one specimen from Penang Hill.

Hab. Malay Peninsula, Sumatra, and Borneo.

29. LYCODON SUBCINCTUS, Boie.

Lycodon platurinus, Cantor, p. 96.
Lycodon subcinctus, Boul. Cat. Snakes, i. p. 359.

Cantor mentions one specimen from Penang Hill, and there are two specimens in the British Museum from Singapore; I obtained one specimen at Singapore. Ventrals 202; subcaudals 85; length 635 mm.

Hab. Malay Peninsula, Sumatra, Borneo, Java, Philippines.

30. DRYOCALAMUS SUBANNULATUS, D. & B.

Nymphophidium subannulatum, Blanford, P. Z. S. 1881, p. 219.
Dryocalamus subannulatus, Boul. Cat. Snakes, i. p. 371.

There is a specimen in the British Museum from Singapore from Mr. Ridley; and Blanford mentions a specimen from Singapore belonging to the Raffles Museum; I obtained one from Province Wellesley.

Hab. Malay Peninsula and Sumatra.

31. ZAOCYS CARINATUS, Gthr.

Zaocys carinatus, Boul. Cat. Snakes, i. p. 377, pl. xxvii. fig. 1.

There are specimens in the British Museum from Perak and Singapore.

Hab. Malay Peninsula, Sumatra, and Borneo.

32. ZAMENIS KORROS, Schl.

Coluber korros, Cantor, p. 74.
Zamenis korros, Boul. Cat. Snakes, i. p. 384.

I obtained one specimen near Taiping, Perak. Cantor records it from Penang, Singapore, and the Peninsula; Stoliczka found it in the collection he got from Penang and Province Wellesley; and there are specimens in the British Museum from Penang and Singapore.

Hab. Sikhim Himalayas, Assam, Burma, Western Yunnan, Southern China, Siam, Malay Peninsula, Sumatra, and Java.

33. ZAMENIS MUCOSUS, L.

Zamenis mucosus, Boul. Cat. Snakes, i. p. 385.

There is a specimen in the British Museum from Singapore from Dr. Dennys.

Hab. Transcaspia, Afghanistan, India, Ceylon, Burma, Southern China, Siam, Malay Peninsula, and Java.

34. ZAMENIS FASCIOLATUS, Shaw.

Coluber fasciolatus, Cantor, p. 72.
Zamenis fasciolatus, Boul. Cat. Snakes, i. p. 404.

Cantor obtained this species in Province Wellesley.

Hab. Northern India, Madras, Malay Peninsula.

35. XENELAPHIS HEXAGONOTUS, Cant.

Coluber hexagonotus, Cantor, p. 74.
Ptyas hexagonotus, Stol. J. A. S. B. 1870, p. 186.
Xenelaphis hexagonotus, Boul. Cat. Snakes, ii. p. 8.

I obtained two specimens at Singapore. There are two in the Raffles Museum labelled Pahang, the largest being 1575 mm. in length. Cantor obtained one on Penang Hill. Stoliczka found this species "in a pool of a fresh-water stream on the northern side of Penang Island," and also in the collection he got from Penang and Province Wellesley, and there are specimens in the British Museum from Singapore.

Hab. Burma, Malay Peninsula, Sumatra, Borneo, and Java.

Note.—Peters (Monatsb. Berl. Ac. 1859, p. 269) mentions a specimen of *Coluber hexagonotus*, Cantor, from Singapore.

36. COLUBER PORPHYRACEUS, Cant.

Psammophis nigrofasciatus, Cantor, P. Z. S. 1839, p. 53.
Coluber porphyraceus, Boul. Cat. Snakes, ii. p. 34.

Cantor obtained a specimen from Singapore.

Hab. Eastern Himalayas, hills of Assam, Burma, Yunnan, Malay Peninsula, and Sumatra.

37. COLUBER OXYCEPHALUS, Boie.

Herpetodryas oxycephalus, Cantor, p. 80.
Coluber oxycephalus, Boul. Cat. Snakes, ii. p. 56.

Cantor obtained two specimens in the hills of Penang; Stoliczka found it in the collection he got from Penang and Province Wellesley; and there is a specimen in the British Museum from Singapore.

Hab. Eastern Himalayas, Malay Peninsula and Archipelago.

Note.—Peters (Monatsb. Berl. Ac. 1859, p. 269) mentions a specimen from Malacca.

38. COLUBER MELANURUS, Schl.

Coluber melanurus, Boul. Cat. Snakes, ii. p. 60.

I obtained specimens from Province Wellesley and Singapore; there are several specimens in the Raffles Museum, one being 1830 mm. in length. Stoliczka found it in the collection he got from Penang and Province Wellesley; and there are specimens in the British Museum from Penang and Singapore.

Hab. Southern China, Burma, Malay Peninsula, Sumatra, Borneo, and Java.

39. COLUBER RADIATUS, Schl.

Coluber radiatus, Cantor, p. 73; Boul. Cat. Snakes, ii. p. 61.

Cantor records this species from Penang, Singapore, and the Peninsula; Stoliczka found it in the collection he got from Penang and Province Wellesley; and there is a specimen in the British Museum from Penang from Gen. Hardwicke's collection.

Hab. Southern China, Eastern Himalayas, Bengal, Assam, Burma, Cochinchina, Malay Peninsula, Sumatra, and Java.

40. GONYOPHIS MARGARITATUS, Ptrs.

Gonyophis margaritatus, Boul. Cat. Snakes, ii. p. 71.

Mr. Boulenger mentions a specimen from Singapore, now in the Indian Museum, Calcutta (Ann. Mag. N. H. (6) viii. 1891, p. 290).

Hab. Malay Peninsula, Borneo.

41. DENDROPHIS PICTUS, Boie.

Leptophis pictus, Cantor, p. 82.

Dendrophis pictus, Boul. Cat. Snakes, ii. p. 78.

I obtained this species at Kulim, Kedah, at Taiping, Perak, at Tanglin, Singapore, and from Linga Island. Cantor found it at Penang, and Stoliczka in the collection he got from Penang and Province Wellesley.

Hab. Eastern Himalayas, Bengal, hills of Southern India, Burma, Indo-China, Malay Peninsula and Archipelago.

42. DENDROPHIS FORMOSUS, Boie.

Dendrophis formosus, Boul. Cat. Snakes, ii. p. 84.

I obtained one specimen of this handsome Snake from Crangi, Singapore, and another from Province Wellesley; the latter 1372 mm. in length. The colours of the former when freshly killed were: top of head dark red-brown; upper surface of neck

red; body and tail bronze-brown, each scale with a distinct black border; a black stripe on each side of the head passing through eye; upper lip, chin, and throat bright citron-yellow; lower parts olive-green, black lines on the lateral keels and each subcaudal distinctly bordered with black. In the latter specimen there were no black lines on the lateral keels, or black borders to subcaudal scales. There is one specimen in the British Museum from Malacca.

Hab. Malay Peninsula, Borneo, and Java.

43. DENDRELAPHIS CAUDOLINEATUS, Gray.

Leptophis caudalineatus, Cantor, p. 85.
Dendrelaphis caudolineatus, Boul. Cat. Snakes, ii. p. 89.

I obtained one specimen at Singapore; there is a specimen in the Raffles Museum labelled Pahang. Cantor mentions it from Penang Hill and Singapore; Stoliczka caught it at Penang, and also found it in the collection he got from Penang and Province Wellesley; and there are two specimens in the British Museum from Singapore from Dr. Dennys, and one from Perak from Mr. Leech.

Hab. Southern India, Mergui, Malay Peninsula and Archipelago.

44. SIMOTES PURPURASCENS, Schl.

Xenodon purpurascens, Cantor, p. 67.
Simotes catenifer, Stol. J. A. S. B. 1873, p. 121, pl. xi. fig. 3.
Simotes dennysi, Blanford, P. Z. S. 1881, p. 218, pl. xxi. fig. 1.
Simotes purpurascens, Boul. Cat. Snakes, ii. p. 218.

Cantor met with this species on Penang Hill; Stoliczka found it in the collection he got from Penang and Province Wellesley, and also records a specimen from Johore; there is a specimen in the British Museum from Singapore; and I obtained one specimen from Province Wellesley.

Hab. South China, Cochinchina, Siam, Malay Peninsula, Sumatra, Borneo, and Java.

45. SIMOTES CYCLURUS, Cant.

Simotes bicatenatus, Stol. J. A. S. B. 1873, p. 114.
Simotes cyclurus, Boul. Cat. Snakes, ii. p. 219.

Stoliczka found this species in the collection he got from Penang and Province Wellesley.

Hab. Bengal, Assam, Burma, Siam, Cochinchina, Southern China, Malay Peninsula, and Sumatra.

46. SIMOTES OCTOLINEATUS, Schn.

Simotes octolineatus, Boul. Cat. Snakes, ii. p. 224.

I obtained a specimen near Taiping, Perak. Ventrals 158; subcaudals 47. The colour was—above very dark brown, beneath white, vertebral line scarlet and three white lines along each side. A specimen caught at Tanglin, Singapore (ventrals 183; subcaudals 61), was coloured yellow, with eight black longitudinal

lines, and the space on centre of back between the two broadest black lines was red; the belly was also bright red.

A third specimen was caught in the Botanical Gardens, Singapore. Ventrals 168; subcaudals 59. Colours (from spirit):—Pale brown above, shading to buff underneath, with eight very dark-brown longitudinal lines, those nearest the centre of the back are the broadest, blackest, and most distinctly defined; the outer lines are narrow, light, and indistinct; the intermediate rows are transitional in width, colour, and sharpness of outline.

There is a specimen in the British Museum from Singapore from Dr. Dennys.

Hab. Southern India, Malay Peninsula and Archipelago.

47. SIMOTES SIGNATUS, Gthr.

Simotes signatus, Günth. Rept. Brit. Ind. p. 215, pl. xx. fig. F; Boul. Cat. Snakes, ii. p. 226.

There are two specimens in the British Museum from Singapore.

Hab. Malay Peninsula, Sumatra, Java.

48. SIMOTES CRUENTATUS, Gthr.

Simotes cruentatus, Stol. J. A. S. B. 1873, p. 121; Boul. Cat. Snakes, ii. p. 231, pl. x. fig. 1.

Stoliczka mentions this species as being in the collection he got from Penang and Province Wellesley.

Hab. Burma and Malay Peninsula.

49. ABLABES TRICOLOR, Schl.

Ablabes tricolor, Boul. Cat. Snakes, ii. p. 281.

Mr. Ridley has found this species in the Botanical Gardens at Singapore; two specimens collected by him there are in the British Museum.

Hab. Malay Peninsula, Sumatra, Borneo, Java.

50. ABLABES BALIODIRUS, Boie.

Coronella baliodeira, Cantor, p. 66.

Ablabes baliodirus, Boul. Cat. Snakes, ii. p. 283.

Cantor obtained two specimens from the hills of Penang; I obtained one from Province Wellesley.

Hab. Malay Peninsula, Sumatra, Borneo, Java.

51. ABLABES LONGICAUDA, Ptrs.

Ablabes longicauda, Boul. Cat. Snakes, ii. p. 284.

Müller mentions a specimen from Penang in the Bâle Museum (Verh. natur. Ges. Basel, 1882, p. 143).

Hab. Malay Peniesula, Sumatra, Borneo.

52. MACROCALAMUS LATERALIS, Gthr.

Macrocalamus lateralis, Boul. Cat. Snakes, ii. p. 327.

"The only specimen known is from General Hardwicke's East

India collection, and is probably from the Continent" (Günther, Rept. Brit. Ind. p. 199, pl. xviii. fig. D).

Hab. Malay Peninsula?

53. PSEUDORHABDIUM LONGICEPS, Cant.

Calamaria longiceps, Cantor, p. 63, pl. xl. fig. 1.
Oxycalamus longiceps, Günter, R. B. I. p. 199.
Pseudorhabdium longiceps, Boul. Cat. Snakes, ii. p. 329.

The type specimen was caught on Penang Hill and is preserved in Dr. Cantor's collection. Stoliczka found one specimen in the collection he got from Penang and Province Wellesley. There are specimens in the British Museum from Perak and from Singapore.

I obtained two specimens from Singapore.

Hab. Malay Peninsula and Archipelago.

54. CALAMARIA ALBIVENTER, Gray.

Calamaria linnæi, var., Cantor, p. 62.
Calamaria albiventer, Boul. Cat. Snakes, ii. p. 336.

Cantor records this species from the hills of Penang; there are also specimens from Penang in Gen. Hardwicke's collection in the British Museum; and I obtained one specimen from Province Wellesley.

Hab. Malay Peninsula.

55. CALAMARIA SUMATRANA, Edel.

Calamaria sumatrana, W. L. Sclater, J. A. S. B. lx. 1891, p. 233; Boul. Cat. Snakes, ii. p. 339.

There is a specimen from Singapore in the India Museum, Calcutta.

Hab. Malay Peninsula, Sumatra.

56. CALAMARIA LEUCOCEPHALA, D. & B.

Calamaria lumbricoidea, var., Cantor, p. 61.
Calamaria leucocephala, Boul. Cat. Snakes, ii. p. 344.

Cantor records this species from the hills of Penang and Singapore, and there is a specimen in the British Museum from Singapore from Dr. Dennys.

Hab. Malay Peninsula, Sumatra, Borneo, Java.

57. CALAMARIA PAVIMENTATA, D. & B.

Calamaria pavimentata, Boul. Cat. Snakes, ii. p. 348.

This Snake appears not to have been recorded before from the Malay Peninsula. I found one under a stone on Penang Hill, 2100 feet. Ventrals 154; subcaudals 9; length 190 mm.

Colour—upper parts reddish-brown in front, turning to dark olive-brown on the back, with nine longitudinal black lines; sides of head yellow, orange collar-mark; bright yellow marks at base and tip of tail; lower parts greenish-yellow.

I obtained a second specimen from the Province Wellesley; in coloration and marking identical with the Penang specimen.

Hab. Burma, Siam, Cochinchina, Canton, Malay Peninsula, and Java.

Series **Opisthoglypha**.

Subfamily HOMALOPSINÆ.

58. HYPSIRHINA INDICA, Gray.

Hypsirhina indica, Boul. Cat. Snakes, iii. p. 4, pl. i. fig. 1.

There are two specimens from General Hardwicke's collection in the British Museum, supposed to be from the Malay Peninsula.

Hab. Malay Peninsula?

59. HYPSIRHINA PLUMBEA, Boie.

Homalopsis plumbea, Cantor, p. 101.
Hypsirhina plumbea, Boul. Cat. Snakes, iii. p. 5.

Cantor mentions "two specimens taken in rivulets in the valley of Penang." There is a specimen in the British Museum from Penang from Gen. Hardwicke. Stoliczka found it in the collection he got from Penang and Province Wellesley.

Hab. Burma, Southern China, Indo-China, Malay Peninsula and Archipelago.

60. HYPSIRHINA ENHYDRIS, Schn.

Homalopsis enhydris, Cantor, p. 99.
Hypsirhina enhydris, Boul. Cat. Snakes, iii, p. 7.

There are specimens in the British Museum from Penang from Dr. Cantor, and from Singapore from Mr. Swinhoe. Stoliczka found it in the collection he got from Penang and Province Wellesley.

Hab. India, Ceylon, Burma, Southern China, Cochinchina, Siam, Malay Peninsula and Archipelago.

61. HYPSIRHINA SIEBOLDII, Schl.

Homalopsis sieboldii, Cantor, p. 98.
Hypsirhina sieboldii, Boul. Cat. Snakes, iii. p. 11.

Cantor obtained one specimen from Province Wellesley.

Hab. India, Burma, Malay Peninsula.

62. HOMALOPSIS BUCCATA, L.

Homalopsis buccata, Cantor, p. 96; Boul. Cat. Snakes, iii. p. 14 (skull fig.).

Cantor records this species from Penang and the Peninsula. Stoliczka found it in the collection he got from Penang and Province Wellesley, and there are specimens in the British Museum from Malacca and Singapore.

I obtained two specimens at Singapore; the larger was 1130 mm. in length.

Hab. Burma, Indo-China, Malay Peninsula, Sumatra, Borneo, and Java.

63. CERBERUS RHYNCHOPS, Schn.

Homalopsis rhynchops, Cantor, p. 94.
Cerberus rhynchops, Boul. Cat. Snakes, iii. p. 16.

Cantor mentions this species from the "Malay Peninsula and Islands," and there are specimens in the British Museum from Penang from him, and from Singapore from Dr. Dennys. Stoliczka found it in the collection he got from Penang and Province Wellesley.

This appears to be a common species. I obtained one specimen from Tanglin, Singapore, six from Changi, Singapore (sea-water), and three from Linga Island (sea-water). Seven of these had 23 rows of scales, and three 25 rows; the ventrals varied from 139 to 150 and the subcaudals from 54 to 64; they varied in length from 470 to 670 mm.

Both *Homalopsis* and *Cerberus* seem sluggish on land, and gentle when handled.

Hab. India, Ceylon, Burma, Indo-China, Malay Peninsula and Archipelago, and the Pelew Islands.

64. FORDONIA LEUCOBALIA, Schl.

Homalopsis leucobalia, Cantor, p. 102.
Fordonia leucobalia, Boul. Cat. Snakes, iii. p. 21.

Cantor says this species is found in freshwater, in estuaries, and at sea at Penang and in the Peninsula.

Hab. Rivers and coasts of Bengal, Burma, Cochinchina, Malay Peninsula and Archipelago, New Guinea, and North Australia.

65. CANTORIA VIOLACEA, Gir.

Cantoria elongata, Günther, Rept. Brit. Ind. p. 277.
Cantoria violacea, Boul, Cat. Snakes, vol. iii. p. 23; id. Faun. Brit. Ind., Rept. p. 380 (head figured).

A specimen was procured at Singapore by the U.S. Exploring Expedition, under the command of Capt. Charles Wilkes, U.S.N. (Girard, Proc. Ac. Philadelphia, 1857, p. 182.)

Hab. Burma, Malay Peninsula, Borneo.

66. HIPISTES HYDRINUS, Cant.

Homalopsis hydrina, Cantor, p. 104, pl. xl. fig. 4.
Hipistes hydrinus, Boul. Cat. Snakes, iii. p. 24.

Cantor obtained one specimen from the coast of Penang, and two from the coast of Kedah. There is a specimen in the British Museum from Penang from Mr. Day, and Stoliczka found it in the collection he got from Penang and Province Wellesley. Blanford mentions it from Singapore (P. Z. S. 1881, p. 215).

Hab. Mouths of rivers and coasts of Pegu, Siam, and Malay Peninsula.

Subfamily DIPSADOMORPHINÆ.

67. DIPSADOMORPHUS MULTIMACULATUS, Boie.

Dipsas multimaculata, Cantor, p. 76.
Dipsadomorphus multimaculatus, Boul. Cat. Snakes, iii. p. 63.

Cantor mentions this species from the hills of Penang and the Peninsula.

Hab. Southern China, Indo-China, Burma, Malay Peninsula and Archipelago.

68. DIPSADOMORPHUS GOKOOL, Gray.

Dipsas cynodon, part., Cantor, p. 77.
Dipsadomorphus gokool, Boul. Cat. Snakes, iii. p. 64.

Cantor obtained one specimen on Penang Hill.

Hab. Bengal, Assam, and Malay Peninsula.

69. DIPSADOMORPHUS DENDROPHILUS, Boie.

Dipsas dendrophila, Cantor, p. 76.
Dipsadomorphus dendrophilus, Boul. Cat. Snakes, iii. p. 70.

Cantor records this species from Penang, Singapore, and the Peninsula; Stoliczka found it in the collection he got from Penang and Province Wellesley, and there are specimens in the British Museum from Singapore.

I obtained two large specimens at Kota Star, Kedah; length 1750 and 2310 mm. The yellow markings were very bright and distinct.

Hab. Malay Peninsula and Archipelago.

70. DIPSADOMORPHUS JASPIDEUS, D. & B.

Dipsadomorphus jaspideus, Boul.Cat. Snakes, iii. p. 73; F. Müller, Verh. nat. Ges. Basel, vii. 1882, p. 151.

There is a specimen from Penang in the Bâle Museum.

Hab. Malay Peninsula, Borneo, and Java.

71. DIPSADOMORPHUS DRAPIEZII, Boie.

Dipsadomorphus drapiezii, Boul. Cat. Snakes, iii. p. 74.

There is a specimen in the British Museum from Malacca from Mr. Hervey, also one from Singapore.

I saw one specimen in the jungle on Bukit Tinah, Singapore: ventrals 276, subcaudals 156; length 1524 mm.

Hab. Malay Peninsula and Archipelago.

72. DIPSADOMORPHUS CYNODON, Boie.

Dipsas cynodon, part., Cantor, p. 77.
Dipsadomorphus cynodon, Boul. Cat. Snakes, iii. p. 78.

Cantor obtained this species in Province Wellesley. Stoliczka mentions *Dipsas cynodon* as being in the collection which he got from Penang and Province Wellesley. There are specimens in the

British Museum from Malacca from Mr. Hervey, and from Singapore from Mr. Ridley and Dr. Dennys.

Hab. Assam, Burma, Malay Peninsula and Archipelago.

73. PSAMMODYNASTES PULVERULENTUS, Boie.

Psammodynastes pulverulentus, Boul. Cat. Snakes, iii. p. 172.

Stoliczka mentions this species as occurring in the collection he got from Penang and Province Wellesley; and there is a specimen in the British Museum from Kinta, Perak, from Mr. Wray.

Hab. Eastern Himalayas, Khasi and Assam hills, Burma, Indo-China, Malay Peninsula and Archipelago.

74. DRYOPHIS XANTHOZONA, Boie.

Dryinus prasinus, var. A, Cantor, p. 82.

Dryophis xanthozona, Boul. Cat. Snakes, iii. p. 180.

There is a specimen from Penang from Dr. Cantor in the British Museum.

Hab. Malay Peninsula and Java.

75. DRYOPHIS PRASINUS, Boie.

Dryinus prasinus, part., Cantor, p. 81.

Dryophis prasinus, Boul. Cat. Snakes, iii. p. 180.

There are specimens in the British Museum from Penang from Dr. Cantor, and from Singapore from Dr. Dennys. Stoliczka found it in the collection he got from Penang and Province Wellesley. I obtained one specimen in Penang; but in Singapore, about Tanglin, found this Snake in abundance, coloured either bright green or light brown; judging from the specimens I observed, the green variety seems to predominate and to grow to a larger size than the brown. The longest green one I measured was 1778 mm. in length, but I have seen one about 2000 mm. These Snakes are very gentle when handled.

Hab. Eastern Himalayas, Assam, Burma, Indo-China, Malay Peninsula and Archipelago.

76. DRYOPHIOPS RUBESCENS, Gray.

Chrysopelea rubescens, Stoliczka, J. A. S. B. 1870, p. 195.

Dryophiops rubescens, Boul. Cat. Snakes, iii. p. 194.

Stoliczka found one specimen on Penang Hill, and also in the collection he got from Penang and Province Wellesley.

Hab. Siam, Malay Peninsula and Archipelago.

77. CHRYSOPELEA ORNATA, Shaw.

Leptophis ornatus, part., Cantor, p. 87.

Chrysopelea ornata, Boul. Cat. Snakes, iii. p. 196.

Var. A. There are specimens in the British Museum from Penang from Dr. Cantor, and from Singapore from Dr. Dennys. Stoliczka describes this species as common on Penang Hill in 1869, and found it in the collection he got from Penang and Province

Wellesley. I obtained one specimen from Kulim, Kedah, and two from Singapore, the largest being 1235 mm. in length.

Hab. India, Ceylon, Burma, Southern China, Indo-China, Malay Peninsula and Archipelago.

78. CHRYSOPELEA CHRYSOCHLORA, Reinw.

Leptophis ornatus, part., Cantor, p. 87.
Chrysopelea chrysochlora, Boul. Cat. Snakes, iii. p. 198.

Cantor gives Penang and the Peninsula as the localities from which he obtained this species, and there is a specimen in the British Museum from Singapore from Dr. Dennys.

Hab. Burma, Malay Peninsula and Archipelago.

Series **Proteroglypha.**

Subfamily HYDROPHIINÆ.

79. HYDRUS PLATURUS, L.

Hydrus bicolor, Cantor, p. 135.
Hydrus platurus, Boul. Cat. Snakes, iii. p. 267.

Cantor obtained a single specimen from the coast of Province Wellesley. Blanford mentions this species (*Pelamis bicolor*) from Singapore, P. Z. S. 1881, p. 215.

Hab. Indian Ocean, Tropical and Subtropical Pacific.

80. HYDROPHIS CÆRULESCENS, Shaw.

Hydrophis cœrulescens, Boul. Cat. Snakes, iii. p. 275.

There is a specimen in the British Museum from Penang from Dr. Cantor.

Hab. Bombay coast, Bay of Bengal, and Straits of Malacca.

81. HYDROPHIS NIGROCINCTUS, Daud.

Hydrophis nigrocinctus, Boul. Cat. Snakes, iii. p. 277.

Mr. Boulenger informs me that a specimen in the British Museum from Dr. Bleeker is probably from off the coast of Sumatra.

Hab. Bay of Bengal and Straits of Malacca.

82. HYDROPHIS CANTORIS, Gthr.

Hydrus gracilis, part., Cantor, p. 130.
Hydrophis cantoris, Boul. Cat. Snakes, iii. p. 281, pl. xiv.

There is a specimen in the British Museum from Penang from Dr. Cantor.

Hab. Bay of Bengal and Straits of Malacca.

83. HYDROPHIS FASCIATUS, Schn.

Hydrophis fasciatus, Boul. Cat. Snakes, iii. p. 281.

There is a specimen in the British Museum from Penang from Cantor.

Hab. From the coasts of India to China and New Guinea.

84. HYDROPHIS TORQUATUS, Gthr.

Hydrus nigrocinctus, Cantor, p. 128.
Hydrophis torquatus, Boul. Cat. Snakes, iii. p. 283.

Cantor gives as locality of this species "sea of Malayan Peninsula, Penang, and Singapore."

Hab. Bay of Bengal and Straits of Malacca.

85. DISTIRA STOKESII, Gray.

Distira stokesii, Boul. Cat. Snakes, iii. p. 288 (skull fig. p. 286).

There are specimens in the British Museum from Singapore. Blanford mentions two specimens (one 1626 mm. long) from Singapore (P. Z. S. 1881, p. 215).

Hab. Indian Ocean, Straits of Malacca, and north coast of Australia.

86. DISTIRA BRUGMANSII, Boie.

Hydrus striatus, part., Cantor, p. 126.
Distira brugmansii, Boul. Cat. Snakes, iii. p. 292.

There is a specimen in the British Museum from Penang from Dr. Cantor.

Hab. Persian Gulf, coasts of India and Burma, Straits of Malacca, and the Malay Archipelago.

87. DISTIRA CYANOCINCTA, Daud.

Hydrus striatus, part., Cantor, p. 126.
Distira cyanocincta, Boul. Cat. Snakes, iii. p. 294.

There is a specimen in the British Museum from Singapore.

Hab. From the Persian Gulf and the coasts of India to China, Japan, and Papuasia.

88. DISTIRA JERDONII, Gray.

Hydrus nigrocinctus, var., Cantor, p. 129, pl. xl. fig. 8.
Distira jerdonii, Boul. Cat. Snakes, iii. p. 299.

There is a specimen in the British Museum from Penang from Dr. Cantor.

Hab. Bay of Bengal, Straits of Malacca, and Borneo.

89. ENHYDRIS HARDWICKII, Gray.

Hydrus pelamidoides, Cantor, p. 133.
Enhydris hardwickii, Boul. Cat. Snakes, iii. p. 301.

Cantor mentions "sea of Malayan Peninsula and Islands" among the localities of this species. Günther (Rept. Brit. India, p. 380) says of the typical specimen of *Hydrophis hardwickii*, "several circumstances lead me to suppose it was procured at Penang." There are two specimens in the British Museum from Singapore from Mr. Swinhoe.

Hab. From the Bay of Bengal to the Chinese Sea and New Guinea.

90. Enhydrina valakadien, Boie.

Hydrus schistosus, Cantor, p. 132.
Enhydrina valakadien, Boul. Cat. Snakes, iii. p. 302.

There is a specimen in the British Museum from Penang from Dr. Cantor.

Hab. From the Persian Gulf, along the coasts of India and Burma to the Malay Archipelago and Papuasia.

91. Aipysurus eydouxi, Gray.

Aipysurus eydouxii, Boul. Cat. Snakes, iii. p. 304.

Boettger mentions three specimens said to have been caught at Singapore (Zool. Anz., 1892, p. 420).

I obtained one specimen, a male, from Sourabaya, Java, and kept it alive in a tin of sea water for about a month, when it died through an accident. It was gentle when handled, never attempting to bite. It could move fast, but awkwardly, on dry land, and sometimes would crawl out of the water of its own accord. The colours in life are very handsome—above dark olive-brown, with bright yellow transverse stripes, the stripes and edges of the brown scales outlined in black; beneath bright yellow. Ventrals 134. Length 559 mm.

Hab. Seas of Malay Archipelago.

92. Platurus colubrinus, Schn.

Laticauda scutata, Cantor, p. 125.
Platurus colubrinus, Boul. Cat. Snakes, iii. p. 308 (skull fig. p. 307).

There is a specimen in the British Museum from Penang from Dr. Cantor. Blanford mentions this species (*Platurus scutatus*) from Singapore (P. Z. S. 1881, p. 215).

Hab. From the Bay of Bengal to the China Sea and the West South Pacific.

Subfamily Elapinæ.

93. Bungarus fasciatus, Schn.

Bungarus fasciatus, Cantor, p. 113; Boul. Cat. Snakes, iii. p. 366.

Cantor mentions this species from Penang and Prov. Wellesley, and Stoliczka found it in the collection he got from Penang and Province Wellesley. Blanford mentions it from Singapore.

Hab. India, Burma, Southern China, Indo-China, Malay Peninsula, Sumatra, and Java.

94. Bungarus candidus, L.

Bungarus candidus, Cantor, p. 113; Boul. Cat. Snakes, iii. p. 368 (skull fig. p. 365).

Cantor mentions this species from Kedah, and there are five

specimens from him in the British Museum from Penang and the Peninsula.

Hab. India, Burma, Southern China, Indo-China, Malay Peninsula, Java, and Celebes.

95. BUNGARUS FLAVICEPS, Reinh.

Bungarus flaviceps, Cantor, p. 112; Boul. Cat. Snakes, iii. p. 371.

I obtained one specimen from Province Wellesley. Ventrals 237; subcaudals 53, of which the first 16 were single and the remainder double, except the 19th, 29th, 30th, 31st, and 32nd. There were three postoculars on the right side. It was 1473 mm. in length.

Cantor mentions obtaining one specimen on Penang Hill.

Hab. Tenasserim, Cochinchina, Malay Peninsula, Sumatra, Borneo, and Java.

96. NAIA TRIPUDIANS, Merr.

Naja lutescens, Cantor, p. 117.
Naia tripudians, Boul. Cat. Snakes, iii. p. 380.

Cantor says this species is found in Penang, Singapore, and the Peninsula, and that the brown variety prevails at Penang and the black at Singapore. Several residents in the Settlements have told me the same thing. The largest Cobra I met with was a black one in Singapore, 1372 mm. long. Mr. Ridley caught in the Botanical Gardens, Singapore, a Cobra in the act of swallowing a *Macropisthodon rhodomelas*. A Cobra that I obtained from Kulim, Kedah, belonged to a third colour variety, C. *b.* in Boulenger's 'Catalogue of Snakes.'

Hab. Southern Asia, from Transcaspia to China and the Malay Archipelago.

97. NAIA BUNGARUS, Schl.

Hamadryas ophiophagus, Cantor, p. 116.
Naia bungarus, Boul. Cat. Snakes, iii. p. 386.

Cantor records this species from Penang Hill and Province Wellesley, and there is a specimen in the British Museum from Singapore from Dr. Dennys. From all accounts the Hamadryad is still common in the hills of Penang, and I have seen several skins of large individuals killed near Taiping, Perak.

Hab. India, Burma, Indo-China, Southern China, Malay Peninsula and Archipelago.

98. CALLOPHIS GRACILIS, Gray.

Elaps nigromaculatus, Cantor, p. 108, pl. xl. fig. 7.
Callophis gracilis, Boul. Cat. Snakes, iii. p. 396.

Cantor records this species from the hills of Penang and from Singapore.

Hab. Malay Peninsula and Sumatra.

99. Callophis maculiceps, Gthr.

Elaps melanurus, Cantor, p. 106, pl. xl. fig. 6.
Callophis maculiceps, Boul. Cat. Snakes, iii. p. 397.

Cantor obtained one specimen from Province Wellesley.

Hab. Cochinchina and Malay Peninsula.

100. Doliophis bivirgatus, Boie.

Elaps bivirgatus, Cantor, p. 109.
Elaps flaviceps, Cantor, P. Z. S. 1839, p. 33.
Doliophis bivirgatus, Boul. Cat. Snakes, iii. p. 400.

Cantor obtained this species from the hills of Penang and from Malacca; Stoliczka found it in the collection he got from Penang and Province Wellesley, and there are specimens in the British Museum from Penang and Singapore.

I obtained specimens from Kulim, Kedah, from Singapore, and from Province Wellesley, the latter 1372 mm. in length.

Hab. Burma, Cochinchina, Malay Peninsula, Sumatra, Borneo, and Java.

Note.—Girard, Proc. Ac. Philad. 1857, p. 182, records a specimen of *Doliophis flaviceps* from Singapore.

101. Doliophis intestinalis, Laur.

Elaps intestinalis, Cantor, p. 107.
Elaps furcatus, Cantor, P. Z. S. 1839, p. 34.
Doliophis intestinalis, Boul. Cat. Snakes, iii. p. 401.

Of this Snake Cantor says "it is of no uncommon occurrence in the hills of Penang, at Malacca, and at Singapore." Stoliczka found it in the collection he got from Penang and Province Wellesley. I obtained two specimens from Tanglin, Singapore, and two from Province Wellesley, one of the latter belonging to the variety *trilineatus*. There are in the British Museum specimens of the variety *lineata* from Penang and Singapore, and of *annectens* from Singapore.

Hab. Burma, Malay Peninsula and Archipelago.

Family Amblycephalidæ.

102. Haplopeltura boa, Boie.

Dipsas boa, Cantor, p. 78, pl. xl. fig. 3.
Haplopeltura boa, Boul. Cat. Snakes, iii. p. 439.

Cantor obtained this species from the hills of Penang.

Hab. Malay Peninsula and Archipelago.

103. Amblycephalus lævis, Boie.

Amblycephalus lævis, Boul. Cat. Snakes, iii. p. 441.

This Snake is said to have been found at Malacca, but I have not been able to discover where it is recorded.

Hab. Malay Peninsula, Natuna Islands, Borneo, and Java.

104. AMBLYCEPHALUS MALACCANUS, Ptrs.

Asthenodipsas malaccana, Peters, Mon. Berl. Ac. 1864, p. 273, pl. —. fig. 3.

Amblycephalus malaccanus, Boul. Cat. Snakes, iii. p. 442.

One specimen was obtained in the neighbourhood of Malacca (*see* Peters, *l. s. c.*).

Hab. Malay Peninsula, Sumatra, Borneo.

Family VIPERIDÆ.

Subfamily CROTALINÆ.

105. LACHESIS MONTICOLA, Gthr.

Trimeresurus convictus, Stoliczka, J. A. S. B. 1879, p. 224, pl. xii. fig. 1.

Lachesis monticola, Boul. Cat. Snakes, iii. p. 548.

Stoliczka caught one specimen on Western Hill, Penang, and there is a specimen in the British Museum from Singapore.

Hab. Tibet, Himalayas, Assam, Burma, Malay Peninsula, and Sumatra.

106. LACHESIS PURPUREOMACULATUS, Gray.

Trigonocephalus puniceus, Cantor, p. 122.

Lachesis purpureomaculatus, Boul. Cat. Snakes, iii. p. 553.

Cantor records this species from Penang and the Peninsula.

Var. A.—There are specimens in the British Museum from Penang and Singapore. 1 obtained one from Tanjong Katong, Singapore. Ventrals 172; subcaudals 57 (double, except the 2nd and 3rd, which were single). Scales in 25 rows.

Var. B.—There is one specimen in the British Museum from Penang from Dr. Cantor.

Hab. Himalayas, Bengal, Assam, Burma, Andamans, Nicobars, Malay Peninsula, and Sumatra.

107. LACHESIS GRAMINEUS, Shaw.

Trigonocephalus gramineus, part., Cantor, p. 119.

Trimeresurus erythrurus, Stoliczka, J. A. S. B. 1870, p. 217.

Lachesis gramineus, Boul. Cat. Snakes, iii. p. 554.

Cantor gives Penang, Singapore, and the Peninsula as localities of this species; Stoliczka obtained specimens from Penang and Province Wellesley; and I obtained four specimens from Province Wellesley. Blanford mentions this species from Singapore.

Hab. South-eastern Asia.

108. LACHESIS SUMATRANUS, Raffles.

Lachesis sumatranus, Boul. Cat. Snakes, iii. p. 557.

There is a specimen in the British Museum from Singapore from Dr. Dennys.

Hab. Malay Peninsula and Archipelago.

109. Lachesis wagleri, Boie.

Trigonocephalus sumatranus, Cantor, p. 121, pl. xl. fig. 9.
Lachesis wagleri, Boul. Cat. Snakes, iii. p. 562.

Cantor gives Penang, Singapore, and the Peninsula as localities of this species; Stoliczka found it in the collection he got from Penang and Province Wellesley. There are specimens in the British Museum from Penang, Taiping (Perak), Malacca, and Singapore. I obtained a specimen on Bukit Timah, Singapore. Blanford mentions this species from Singapore and Selangor.

Hab. Malay Peninsula and Archipelago.

Class BATRACHIA.

Order ECAUDATA.

Suborder PHANEROGLOSSA.

Series Firmisternia.

Family Ranidæ.

1. Oxyglossus lima, Tschudi.

Oxyglossus lima, Boul. Cat. Batr. Sal. p. 5.

This species is said to occur in the Malay Peninsula, but I have not been able to find it recorded south of Tenasserim, though it occurs again in Java.

Hab. Lower Bengal, Burma, Southern China, Camboja, Siam, Malay Peninsula, Java.

2. Oxyglossus lævis, Gthr.

Oxyglossus lævis, Boul. Cat. Batr. Sal. p. 6.

There are specimens in the British Museum from Perak from Mr. Wray, one from Larut, the other from Changkatjerin. I found two specimens in the Raffles Museum, unlabelled.

Hab. Burma, Malay Peninsula and Archipelago, Philippine Islands.

3. Rana cyanophlyctis, Schn.

Rana leschenaultii, Cantor, p. 138.
Rana cyanophlyctis, Boul. Cat. Batr. Sal. p. 17.

Cantor mentions two specimens from the Malay Peninsula, and says "the species is apparently not numerous."

Hab. South Arabia, Baluchistan, Cashmere, Himalayas (up to 6000 ft.), India, Ceylon, Malay Peninsula.

4. Rana laticeps, Blgr.

Rana laticeps, Boul. Cat. Batr. Sal. p. 20, pl. i. fig. 1.

There is a specimen in the British Museum from Malacca from

Mr. Hervey. A Frog in the Raffles Museum, Singapore, labelled "Malacca," is apparently of this species, but it is in a bad state of preservation, and the back is quite smooth, without the tubercles which are present in Mr. Hervey's specimen; both are females.

Hab. India, Malay Peninsula.

5. RANA MACRODON, Kuhl. (Plate XLV. fig. 1.)

Rana fusca, Stol. J. A. S. B. 1873, p. 115.

Rana macrodon, Blanford, P. Z. S. 1881, p. 225, pl. xxi. fig. 4 (upper view of head); Boul. Cat. Batr. Sal. p. 24, pl. i. fig. 4 (inside of mouth).

As first pointed out by Mr. Blanford, there seem to be two varieties of this species, very different in appearance. The specimens I collected at Penang are so different from those I got at Singapore, as to appear to be of distinct species; but on comparing them with the large series in the British Museum from many different localities in the East Indies, I cannot find any constant characters by which to separate the two varieties.

Stoliczka found this species in the collection he got from Penang and Province Wellesley, but from his description one cannot tell to which variety his specimens belonged. F. Müller mentions a specimen of *Rana macrodon* (Günth. Cat. Batr. p. 8) from Malacca in the Bâle Museum (Verh. naturforsch. Ges. Basel, vii. 1882–85).

The following description will, I trust, be of use in identifying this Frog: provisionally I have called the broad-headed form the Singapore variety, and the narrower-headed the Penang variety.

Vomerine teeth on two straight ridges running obliquely back from the anterior angle of the choanæ, and converging behind so as to meet, if prolonged, nearly in a right angle, but rather widely separated; a strong osseous transverse ridge behind the choanæ; lower jaw with two fang-like bony prominences in front, fitting into hollows inside the upper jaw; when the mouth is closed, the size to which these prominences are developed is variable.

Head large, this is especially so in the adults of the Singapore variety. In the typical Penang variety the snout is usually pointed, but very variable in shape; in the Singapore variety it is broad and rounded at the end. Blanford says of the snout of the Singapore variety, "no trace of *canthus rostralis*," but in my specimens, though but slightly developed, it is at once apparent; no constant distinction can be made between the two varieties in regard to the amount of depression of the snout. Occiput more or less swollen at the sides. The nostrils are nearer the end of snout than the eye; their distance apart in the Penang variety is equal to or greater than the interorbital space, while in the Singapore variety it is *considerably* less: this character will be found useful in distinguishing between the two varieties, but it does not hold good for young specimens. In all seven Penang specimens the breadth across the gape is about equal to the distance from angle of mouth to end of snout, and considerably less than the

length of the hind foot; while in all the adult Singapore specimens examined the breadth across the gape is greater than the distance from angle of mouth to end of snout, and equal to or greater than the length of the hind foot, but in the young of the Singapore variety the gape is less than the hind foot. The interorbital space in the largest Penang specimen is equal to, in the six others less than, the upper eyelid, in some considerably less; in the Singapore variety, in young specimens the interorbital space is slightly less than the upper eyelid, in fair-sized specimens equal to it, and in large specimens one half broader than the upper eyelid. Blanford mentions the Singapore frog as having a smaller eye; but if specimens of similar size of the two varieties are compared, it will be seen not to be noticeable. Tympanum distinct, slightly larger in the Singapore variety, but variable in size; it is also variable in shape, when not circular, in the Singapore variety it has its greater diameter in a vertical position, in the Penang variety in a horizontal direction. In the Singapore variety a strong, prominent fold (well-developed in even quite small specimens) runs from behind the eye horizontally to over the tympanum, and then turns down at an obtuse angle and runs straight to the shoulder; in the Penang variety this fold is much less prominent, and instead of forming an obtuse angle forms a curve above the tympanum; however, this character cannot divide the two forms, as in the British Museum specimens will be found with every gradation from the angular to the curved fold.

Fingers moderate, first much longer than the second; toes broadly webbed, in the Singapore variety the web is more deeply emarginate than in the Penang variety, the terminal two phalanges of the fourth toe have only a narrow fringe of web along their sides. The tarsal fold is very variable in size, and often wanting. The fingers and toes have slightly though distinctly swollen tips, and the subarticular tubercles of fingers and toes are well developed; the inner metatarsal tubercle is elongate and blunt, there is no outer tubercle: in these characters there is no difference between the two varieties. The hind limb being carried forward along the body the tibio-tarsal articulation reaches beyond the eye, usually to the end of the snout: the Penang specimens have on the whole longer hind legs than those from Singapore when measured in this way.

Skin smooth above. Hinder portion of upper eyelid tubercular. In young specimens there is a narrow glandular fold on each side of the back, and other, both round and longitudinal, glands scattered over the skin of the upper surfaces; these glands gradually disappear with age, but seem more persistent in the Penang variety. Male without vocal sacs.

Blanford distinguished the Singapore variety from *Rana fusca* (Blyth) by, 1st, a much broader head; 2nd, a smaller eye; 3rd, a larger tympanum; 4th, flatter muzzle; 5th, nostrils nearer together; 6th, web of the hind toes less developed. Although, as mentioned

before, I can find no constant characters to separate the two varieties, the following points should be noticed:—

(i.) Breadth of interorbital space compared to the distance between the nostrils.
(ii.) General form of the snout.
(iii.) Shape and prominence of the tympanic fold.
(iv.) Shape of the tympanum.
(v.) Amount of emargination in the webbing of the hind toes.

Localities. Of the Penang variety I collected seven specimens in small ponds on Penang Hill, at elevations of from 2000′ to 2200′, in March 1896. They are active frogs and good swimmers, and locally called "Koldok-ayer" (Malay). There is in the British Museum a specimen from Mr. Wray, from the hills of Larut, Perak, at an elevation of between 3000′ and 4000′, which agrees with the Penang variety in the more pointed snout, in the distance between the nostrils being greater than the interorbital space, in the skin having longitudinal glandular folds, and in the webbing of the hind feet, but the tympanic fold is angular.

Of the Singapore variety I collected eight specimens from the following places in the island—Passir Panjang, Botanical Gardens, and Bukit Timah, at elevations of less than 400 ft., in January and April 1896. Four large specimens from Dr. Dennys, one from the Raffles Museum, and three young specimens from Mr. Ridley, all from Singapore, and now in the British Museum, agree with my specimens of corresponding sizes, and are distinctly of this variety, the full-grown ones showing well the characteristic broad head and angular prominent tympanic fold. There are several large specimens of this variety in the Raffles Museum, Singapore; one (in spirit) has a *Dryophis prasinus* in its mouth. This Frog seems common but local in Singapore island, and is known as the "red frog" or "Koldok-merah" (Malay): it is a very handsome animal from its athletic build, bright eye, and brilliant colour, which last, however, helps to conceal the frog when (as I have more than once found it) among large fallen leaves of the same bright red as itself. When frightened, both the Penang and Singapore varieties take to the water, diving straight in and seeking concealment immediately at the bottom.

Although, as far as we know, only the one variety inhabits Penang and the other Singapore, there are specimens of both in the British Museum from Java, and also from Borneo, where are also intermediate forms with the angular tympanic fold, but the distance between the nostrils greater than the interorbital space, and with fully-webbed hind feet. There is a specimen in the British Museum from Great Natuna Island, from Mr. Hose, which seems identical with the Singapore variety.

Colour, from life. Specimens from Penang Hill.—Upper parts rich dark olive-brown or green, with or without a broad orange vertebral line. Chin white. Belly and lower side of limbs pale orange.

Specimens from Singapore.—Upper parts bright bronze or chocolate-red, varies very much in intensity, in captivity becomes a pale yellowish- or brownish-red. In one half-grown specimen the upper parts were a dark olive-brown. A very narrow pale yellow vertebral stripe seems usually present, but often very irregular, not following the centre of the back. Lower surfaces yellow, paler or bluish-white on the throat, more or less spotted or mottled with black. Lips very pale yellow, extensively marked with black. A black line under the fold from eye to tympanum, continued but narrower to angle of mouth. Iris golden. Limbs indistinctly barred with dark brown; a narrow, pale yellow, distinct stripe down the hind leg, the skin behind this is white or yellow, marbled with black; the web between the toes is dark brown. Quite small specimens, of about 40 mm. in length, are very differently coloured from the adults, and somewhat resemble *Rana limnocharis*.

Size. The largest Penang specimen is 92 mm. from snout to vent. The largest Singapore specimen I have measured is 165 mm. from snout to vent, and the width of the head at the angle of the mouth is 76 mm. This species seems to attain a larger size in Singapore than in any other locality.

Hab. Upper Burma, Tenasserim, Malay Peninsula and Archipelago.

6. RANA PLICATELLA, Stol.

Rana plicatella, Stol. J. A. S. B. 1873, p. 116, pl. xi. fig. 1; Boul. Cat. Batr. Sal. p. 26.

This Frog was discovered by Stoliczka in the collection he got from Penang and Province Wellesley.

Hab. Malay Peninsula.

7. RANA TIGRINA, Daud.

Rana tigrina, Cantor, p. 139; Boul. Cat. Batr. Sal. p. 26; id. Fauna Brit. Ind., Rept. p. 449 (figured).

Cantor says this species "is excessively numerous in valleys and hills, after heavy falls of rain, Malayan Peninsula and Islands."

Stoliczka (J. A. S. B. 1873, p. 112) mentions *Rana tigrina*, var. *pantherina*, in the collection he got from Penang and Province Wellesley. There are in the British Museum specimens from Penang, from Dr. Cantor, Major Sykes, and Sir A. Smith.

In April 1895 I found this Frog common in the evening about Kota Star, Kedah.

Hab. Nepal, Sikhim, India, Ceylon, Burma, China, Formosa, Siam, Malay Peninsula and Archipelago.

8. RANA LIMNOCHARIS, Boie.

Rana gracilis, Boul. Cat. Batr. Sal. p. 28; Stol. J. A. S. B. 1870, p. 142.

Rana lymnocharis, Stol. J. A. S. B. 1873, p. 116.

Rana limnocharis, Boul. Fauna Brit. Ind., Rept. p. 450.

Stoliczka says this species is very common in Penang and Province Wellesley, and from Penang Hill (2000 ft.) he obtained a variety which he called *pulla*. There are specimens in the British Museum from Perak from Mr. Wray, from the Dindings from Mr. Ridley, and from Malacca from Mr. Hervey. This Frog was common about Tanglin, Singapore; usually, in April, found sitting on the banks of ponds in the evening; it does not attempt to escape by jumping into the water like *Rana tigrina*, *R. macrodon*, and *R. flammea*, but even if touched squats down close on the clay, which its colour does not resemble, so is easily caught. Stoliczka (J. A. S. B. 1870, p. 153) mentions *Bufo penangensis* as having a similar habit. The largest Tanglin specimen was 62 mm. from snout to vent. Their usual coloration seems, pale olive-green above, with dark green blotches and a distinct, narrow, pale yellow dorsal stripe; the underneath being immaculate buff, except the lips which have distinct black spots, and the throat (male) has two large black blotches.

Hab. Sikhim, India, Ceylon, Burma, China, Formosa, Japan, Siam, Malay Peninsula and Archipelago.

9. RANA HASCHEANA, Stol.

Polypedates hascheanus, Stol. J. A. S. B. 1870, p. 147, pl. ix. fig. 3.

Rana hascheana, Sclater f., P. Z. S. 1892, p. 344.

Stoliczka says: "I found this species tolerably common all through the higher forests (about 1000 feet above sea-level) in the island of Penang; ..... I have seen hundreds of specimens in different places of the island, ... It is generally seen on the leaves of small bushes or on the ground between old leaves."

Hab. Malay Peninsula and Natuna Islands.

10. RANA ERYTHRÆA, Schl. (Plate XLV. fig. 2.)

Limnodytes erythræus, Cantor, p. 141.

Hylarana erythræa, Günther, Rept. Brit. Ind. p. 425.

Rana erythræa, Boul. Cat. Batr. Sal. p. 65.

Cantor mentions having observed three individuals from the Malay Peninsula. Stoliczka (J. A. S. B. 1873, p. 112) found it in the collection he got from Penang and Province Wellesley. There is a specimen in the British Museum from Perak from Mr. Wray. I found one individual in the Lines, Penang, in May 1895, but in Singapore in April 1896. I found it excessively numerous about the ponds at Tanglin and in the Botanical Gardens, in ditches near Thompson Road and in the low-lying fields up the Singapore river, where it may be heard croaking at night. This is a most active, agile Frog, both on land and in the water; it can hop over the surface of a pond, much as *Rana cyanophlyctis* does in India, and also jump right out of the water. Owing to the vivid green colour of its back exactly matching the colour of the weeds in a pond, it is often difficult to see but for its

bright golden eyes. The largest specimens were 72 mm. in length from snout to vent.

Colour (from life).—Above the most vivid green, exactly matching some of the water-weeds in ponds, but in other surroundings the back may change to a dull green or a yellowish brown: no specimens that I met with had "back and sides brown or reddish olive" as described by Cantor, from life? A very dark brown stripe (generally darker at the edges) runs along each side of the head and body from the nose to the inset of the hind leg (in one specimen these side stripes were bright green, like the back, with black edges); this broad dark stripe is separated from the green back by a distinct white or yellowish-white stripe. The upper lip is yellow. The limbs are reddish-buff or yellowish-brown, paler beneath. The underneath of the head and body is immaculate, pure white. The iris is golden or golden-orange.

Hab. Burma, Siam, Malay Peninsula and Archipelago.

11. RANA LABIALIS, Blgr. (Plate XLV. fig. 3.)

Rana labialis, Boul. Ann. & Mag. N. H. 1887, (5) xix. p. 345, pl. x. fig. 1.

This Frog was described from several specimens from Malacca given to the British Museum by Mr. Hervey; specimens have since been received there from Singapore from Mr. Ridley. I caught two specimens at Tanglin, Singapore, in a small pond on the 2nd of April, 1896; it appeared fairly numerous, and was associated with *Rana erythræa*, which it resembles in colour, having the upper parts bright green and the lower immaculate white: this bright green in spirit becomes dull and dark.

Hab. Malay Peninsula and Mentavi Islands.

Tadpole.—I found tadpoles of this species in a small pond in the Botanical Gardens, Singapore, in the middle of April 1896. Length of body about once and a half its width, about two-thirds the length of the tail. Nostrils, as seen from above, nearer the end of the snout than the eyes. Eyes on the upper surface of the body, rather nearer the end of the snout than the spiraculum; the distance between the eyes twice as great as that between the nostrils, and greater than the width of the mouth. Spiraculum on the left side, directed upwards and backwards, situated nearer the anus than the end of the snout, visible from above and from below. Anus opening on the right side, close to the lower edge of the subcaudal crest. Tail three to four times as long as deep, ends in a rounded point, intermediate in shape between those of *Rana esculenta* and *Rana temporaria* (Boul. P. Z. S. 1891, pl. xlv. figs. 1, 3); upper crest convex, slightly deeper than the lower, not extending on to the back; the depth of the muscular portion, at its base, about half or rather more of its greatest total depth.

Beak edged with black. Sides and lower edge of the lip fringed with papillæ, those on the lower edge being long and prominent; upper lip with four series of fine teeth, the outermost is uninter-

rupted, the three inner broadly interrupted and very short, decreasing in size towards the mouth, the innermost row is sometimes very small and inconspicuous; lower lip with three series of teeth, the two outer uninterrupted, the third narrowly interrupted, the three rows are about the same length, but the median is the longest and the outermost the shortest.

The colour of these tadpoles in life is brick-red above, and pale yellow beneath, but the whole skin is very transparent, the eyes and the intestines being clearly seen. On the back on each side behind the eyes is a patch of granulated skin; in some specimens there is a similar strip on the hinder part of the back on each side parallel with the tail, and a large patch on each side of the belly, oblong in shape, and each converging together towards the tail.

A good specimen measures 37 mm. in total length; body 15; width of body 10; tail 22; depth of tail 6.

Depth of muscular portion of tail at its base between 3 and 4 mm.

The above measurements are taken from a spirit-specimen.

12. RANA LUCTUOSA, Ptrs. (Plate XLVI.)

Rana luctuosa, Boul. Cat. Batr. Sal. p. 68.

This handsome little Frog appears to have hitherto only been recorded from Borneo; in March 1896 I found it common about certain small ponds on Penang Hill at an elevation of 2000 feet. They were generally in long grass near the water's edge; when alarmed they would jump into the water, but before long crawl out again.

Colour (from life).—Top of head and back rich dark chocolate-brown (in very small frogs of this species the back is a very bright red, more vermilion than chocolate), bordered on each side from the nose to the insertion of the hind leg by a very distinct white line. Sides of head, neck, and body are very dark brown or black. The tympanum is dark reddish-brown. Along the lower part of the sides of the body are a few white spots in an irregular line from angle of mouth to thigh. Lower surfaces—chin and throat dark brown, remainder dirty buff, darker on limbs. Limbs very dark brown or bluish-black, with bluish-white or very pale grey marblings; the black turns to brown on the toes, and the marbling is also less conspicuous on the feet.

These colours seem permanent and not variable according to surroundings, as is the case with many batrachians.

Adult specimens are 45 to 50 mm. from snout to vent.

Hab. Malay Peninsula; Borneo.

Tadpole, "Koldok-ikan" (Malay). In March 1896, in a pond of clear water (2200 ft. elevation) in the jungle on Penang Hill, there were a large number of tadpoles of this species and little frogs just leaving the water.

Description of the Tadpole.

Length of body once and a half its width, considerably more than half the length of the tail. Nostrils nearer the end of the

snout than the eye. Eyes on the upper surface of the body, nearer the end of the snout than the spiraculum; a well-marked lachrymal gland from the eye to the nostril; the distance between the eyes twice as great, or rather more, than the distance between the nostrils and much greater than the width of the mouth. Spiraculum on the left side, directed backwards and upwards, nearer the anus than the end of the snout, visible from above and from below. Anus opening on the right side, close to the lower edge of the subcaudal crest. Tail between three and four times as long as deep, acutely pointed, the tip being inclined upwards in life; upper crest convex, about equal in depth to the lower; the upper crest does not extend on to the back. Depth of the muscular portion of the tail at its base rather more than half greatest total depth of tail.

Beak broadly edged with black. Sides and lower edge of the lip bordered with papillæ. Upper lip with six series of fine teeth, the upper uninterrupted, the remainder broadly interrupted, decreasing in length towards the beak, the sixth or inner series in some specimens being very small or absent. Lower lip with four long series of teeth, the inner very narrowly interrupted, the remainder uninterrupted.

Colour. The larva till it reaches a total length of from 35 to 40 mm. is blackish-brown above, white beneath, with a grey mottled tail; after this the upper parts are a warm-brown, mottled with darker brown, and the sides and lower parts yellow also mottled with brown, but the skin of the underneath of the abdomen is transparent and of a purple colour; the tail is mottled brown and yellow; the hind legs of the tadpole are grey marbled with black, when the fore legs appear the back assumes the bright chocolate colour of the adult frog. The iris is golden, and the eye bright and noticeable.

Size. Length of body 24 mm. Length of tail 44 mm. Depth of tail 12 mm. The largest tadpole, without hind legs, I observed was 70 mm. in total length; the largest, with hind legs but without fore legs, was 77 mm. The recently transformed young measure about 25 mm. from snout to vent.

13. RANA GLANDULOSA, Blgr.

Rana glandulosa, Boul. Cat. Batr. Sal. p. 73, pl. vii.

There are specimens in the British Museum from Malacca from Mr. Hervey and from Singapore from Mr. Ridley.

Hab. Malay Peninsula, Borneo, and Palawan.

14. RHACOPHORUS LEUCOMYSTAX, Gravh. (Plate XLIV. fig. 2.)

Polypedates leucomystax, Cantor, p. 142.

Polypedates maculatus, Stol. J. A. S. B. 1870, p. 148, & 1873, p. 112.

Rhacophorus maculatus, part., Boul. Cat. Batr. Sal. p. 83.

Rhacophorus leucomystax, Boul. Faun. Brit. Ind., Rept. & Batr. p. 474.

Cantor gives Penang, Singapore, and the Malay Peninsula as localities, and says "although it inhabits Singapore ..... it appears not to occur in the valleys of Penang, but to affect the hills, at an elevation of more than 2000 ft." Stoliczka mentions it as being "not uncommon in Penang." I found this species very common both in Penang and Singapore, but, contrary to Cantor's experience, I found it at Penang at almost the sea-level (20 ft.), though it was certainly more numerous on the hills. It is a cheerful little frog of most graceful build. It comes out from its hiding-places shortly before sunset, and remains abroad all night; the males are easily found as they sit on shrubs or trees or on the edges of the rainwater-butts under the verandahs of the houses, and from time to time utter a single rather musical short croak. In March and April they can be found both by day and night *in copulâ* in ponds. Cantor mentions the power of changing its colours this species possesses. It changes both its colour and markings very rapidly and frequently, but dark bands across the legs can always be more or less distinguished; the lower parts are some shade or other of buff, but the principal variations of the upper parts are as follows:—

(i.) pale bronze, uniform;
(ii.) pale bronze, with four longitudinal dark brown or black lines;
(iii.) a bright yellowish-bronze, almost orange, uniform;
(iv.) reddish-brown, almost chocolate, mottled with darker;
(v.) pale brownish-green or olive, with irregular dark spots;
(vi.) yellowish-green, mottled with darker or brown.

The *Rhacophorus* mentioned by Stoliczka (J. A. S. B. 1873, p. 112) as a separate species, *Polypedates quadrilineatus*, from Penang, is not even a true variety, as the dark lines appear conspicuously and disappear entirely in the same individual. If killed with or without the lines visible they remain so in spirit. In Singapore at different times I noticed many young frogs which had just left the water all of which had the dark lines visible; these disappear as the animal grows, only to reappear temporarily in the adult.

The females are considerably larger than the males; the largest male I caught was 48 mm. from snout to vent, and the largest female 68 mm. from snout to vent.

Hab. Sikhim, Assam, Burma, Southern China, Malay Peninsula and Archipelago, Philippines.

Tadpole. In January, February, March, and April, 1896, I found the tadpoles of this species in several small ponds and in rainwater-butts about Singapore; and was able to collect a large series for the British Museum.

Description of the Tadpole.

Length of body once and a half its width, half the length of the

tail or rather less. Nostrils nearer the end of the snout than the eyes. A strongly-marked lachrymal gland from eye to nostril. Eyes on the side of the head, nearer the spiraculum than the end of the snout; the distance between the eyes more than twice as great as that between the nostrils, and much greater than the width of the mouth.

Spiraculum on the left side, directed backwards and upwards, nearer the anus than the end of the snout, visible from above and from below. Anus opening on the right side, halfway between the lower edge of the subcaudal crest and the muscular portion of the tail. Tail rather more than three times as long as deep, very acutely pointed, upper crest convex, about the same depth as the lower, or in some specimens very markedly shallower; the upper crest does not extend on to the back; the depth of the muscular portion at its base rather more than half the greatest total length.

Beak black. Sides and lower edge of the lip bordered with papillæ, except in the centre of the lower lip, where there is a small semicircular notch, devoid of papillæ. Upper lip with four series of fine teeth, the uppermost uninterrupted, the second narrowly interrupted, and the third and fourth broadly so; lower lip with three long uninterrupted series of teeth.

Colour. Above dark brown, irregularly mottled with darker; beneath buff; the sides and tail buff, mottled with brown. These tadpoles, from different localities, vary a good deal in colour, some being dark brown above, others a light dirty buff colour.

Size. These tadpoles vary even more in size than in colour; some exceptionally fine ones were 46 mm. in total length. Length of body 15·5 mm., length of tail 31, depth of tail 10.

The recently transformed young measure from 14 to 18 mm. from snout to vent.

15. Rhacophorus leprosus, Schl.

Polypedates leprosus, Günther, Ann. & Mag. N. H. (5) xx. 1887, p. 315, pl. xvi. figs. A, *a*, *a'*.

Rhacophorus leprosus, Boul. P. Z. S. 1890, p. 284.

Mr. Wray obtained this species at an elevation of 4000 ft. on the hills of Larut, Perak. He says of it:—"This species ..... lives in holes in trees, and the note produced by it is not so loud as that of *Phrynella*, and has a more metallic ring in it."

Hab. Malay Peninsula; Sumatra.

Note.—*Rhacophorus dennysi* was described by Mr. Blanford (P. Z. S. 1881, p. 224, pl. xxi. fig. 3); the specimen was in a collection sent from Singapore by Dr. Dennys, and was said to have come from China. Since then another specimen of this species has been received at the British Museum from Foochow; so that there can be little doubt that the type specimen was really from China, and that this species should not be included in the fauna of Malaya.

16. Ixalus pictus, Ptrs.

Ixalus pictus, Peters, Mon. Berl. Ac. 1871, p. 580; Peters, Ann. Mus. Civ. Genova, iii. 1872, p. 44, pl. vi. fig. 3; Boul. Cat. Batr. Sal. p. 99.

A specimen of this elegant little spotted Frog, only previously recorded from Borneo, was caught in the jungle on Bukit Timah, Singapore, in Feb. 1896, by Dr. Hanitsch, of the Raffles Museum.

Hab. Malay Peninsula and Borneo.

17. Ixalus asper, Blgr.

Ixalus asper, Boul. P. Z. S. 1886, p. 415, pl. xxxix. fig. 1.

This species was described from specimens sent to the British Museum by Mr. Wray; a pair were "caught breeding in the water on Hill Garden, Larut, Perak, at an elevation of 3300 feet."

Hab. Malay Peninsula, Burma.

Family Engystomatidæ.

18. Calophrynus pleurostigma, Tschudi.

Calophrynus pleurostigma, Boul. Cat. Batr. Sal. p. 158; Boul. Fauna Brit. Ind., Rept. p. 490 (palate fig.).

I obtained one young specimen in the jungle on Bukit Timah, Singapore; this species does not seem to have been previously recorded from the Straits Settlements.

Hab. Burma, South China, Malay Peninsula, Borneo, Natunas.

19. Microhyla achatina, Boie.

Microhyla achatina, Boul. Cat. Batr. Sal. p. 166.

There are ♂ and ♀ specimens in the British Museum from Malacca from Mr. Hervey.

Hab. Tenasserim, Malay Peninsula, Sumatra, Java, and Moluccas.

20. Microhyla berdmorii, Blyth.

Microhyla berdmorii, Boul. Catr. Batr. Sal. p. 166.

Boulenger (Fauna Brit. India, Reptiles p. 492) says, "Mr. W. L. Sclater recently communicated to me a specimen obtained by Mr. Davison at Malacca."

Hab. Burma, Camboja, Malay Peninsula.

21. Callula pulchra, Gray.

Hylædactylus bivittatus, Cantor, p. 143.

Callula pulchra, Boul. Cat. Batr. Sal. p. 170 (hand etc. fig.).

Cantor obtained a male from a field near Malacca; I have not heard of its occurring in Penang.

I have been told by both English and natives that this Frog was unknown in Singapore until some nine or ten years ago, when it was introduced by a half-caste, why it is not known, and that it rapidly spread about the island. It is now well-known as the

"Bull-frog" by the English in Singapore, and detested for the noise it makes at night. These rotund animals were common about Tanglin, and could be heard croaking in March and April (probably in other months also) every night after a rainy day. Their voice is very loud and can be heard from some distance; the croak is a deep guttural "wau-auhhhhk," very strident and prolonged. The males croak while floating on the surface of the water, the mouth, head, and inflated sides of the body just above the surface, the single vocal sac under the mouth inflated like a globe and the arms and legs extended. They can hop well on land, and are good swimmers. The males are easily caught, their voice betraying their position in the dark, but I only obtained one female. Their skin is excessively slimy; when handled the slime comes off profusely, and dries into a sort of white gum, with a faint aromatic smell, not unpleasant. This gum dissolves in hot-water, and coagulates in cold.

The general appearance of these Frogs is very stout, their girth being about twice the length from snout to vent. As observed by Cantor (p. 144), the profile from the snout to the vent forms a considerable arch, the highest part being the centre of the back. As Cantor also observes, "The toes are more slender than the fingers, and their last joint, although flattened, is not so broad as that of the fingers, which is of a somewhat triangular form, truncated in front." The tongue, which is oblong in a spirit-specimen, in life is very elastic, assuming when extended a vermiform shape and reaching about 40 mm. in length; this is probably for feeding on ants, as Stoliczka (J. A. S. B. 1870, p. 155) says of this species near Moulmein, "It appeared after sunset.... crawling on old wood and feeding on white ants."

The pupil is round.

Coloration (from life, April 1896).—Top and sides of head yellow-ochre, shading to brown on the nose, and a brown band runs from the nose to below the eye, beneath the eye it turns dark brown, and in the vertical of the posterior margin of the eye or slightly further back ends abruptly. The upper lip is yellow-ochre. The back is a rich dark brown, divided distinctly from the yellow of the face by a narrow black line, from eye to eye; the upper part of the prominence over the eye being parti-coloured. In the female specimen there were ten or twelve irregular yellowish spots on the back, and a very faint narrow black vertical line. A broad very distinct band of yellow-ochre runs from the eyelid to the inset of the hind leg, with a more or less scolloped outline and bordered above with black, also in some specimens bordered below anteriorly with black. The sides of the belly are more or less mottled with yellow and brown. The lower surfaces are dirty buff. The chin and throat in the *male* are black, and the vocal sac, when collapsed, shows as loose longitudinal folds of black skin under the chin. The limbs are grey, mottled with dark brown, and with more or less distinct patches of yellow-ochre, sometimes on the hind legs outlined with black. The intensity of the colouring varies with individuals and

from time to time: sometimes it is very brilliant, the contrast between the rich dark-brown back and bright yellow face and side stripes being very conspicuous.

Cantor's description (p. 143) is apparently taken from a preserved specimen, contrary to his usual custom. Günther (Rept. Brit. Ind. p. 437) mentions the light band on each side of the back being rose-coloured during life, but this was not so in the Singapore specimens.

The male specimens varied from 64 to 76 mm. in length from snout to vent, the female was 76 mm.

Hab. India, Ceylon, Burma, South China, Siam, Camboja, Malay Peninsula.

22. PHRYNELLA PULCHRA, Blgr.

Phrynella pulchra, Boul. Ann. & Mag. N. H. (5) xix. 1887, p. 346, pl. x. fig. 2.

The type specimens, ♂ ♀, are in the British Museum; they are from Malacca from Mr. Hervey.

Hab. Malay Peninsula, Sumatra, and Mentawi Islands.

23. PHRYNELLA POLLICARIS, Blgr.

Phrynella pulchra, Günth. Ann. & Mag. N. H. (5) xx. 1887, p. 313, pl. xvi. fig. B.

Phrynella pollicaris, Boul. P. Z. S. 1890, p. 37.

The type specimen, a male, is in the British Museum; it was obtained at Perak by Mr. Wray, who says "they inhabit the hills of Perak from 3000 feet upwards, and live in holes in trees which are so situated as to contain more or less rain-water. They have a loud, flute-like, musical note, which they utter at irregular intervals, principally during the night. The form and size of the hole in which they are seem to have a great deal to do with the loudness of the note, as specimens when extracted from their holes have far more feeble vocal powers than they had when in them. The pitch of the note is also much altered by the resonant properties of the cavity. These frogs blow themselves out with air, and look more like bladders than anything else. When inflated they float on the surface of the water, and will remain motionless for a long time with legs and arms stretched out."

Hab. Malay Peninsula.

Series ARCIFERA.

Family BUFONIDÆ.

24. NECTOPHRYNE GUENTHERI, Blgr.

Nectophryne guentheri, Boul. Cat. Batr. Sal. p. 280, pl. xviii. fig. 3.

There is a specimen in the British Museum from Singapore presented by Mr. Ridley; and in January 1896 I obtained two specimens in the jungle on Bukit Timah, Singapore.

Hab. Malay Peninsula, Borneo, and Natuna Islands.

25. Bufo penangensis, Stol.

Ansonia penangensis, Stol. J. A. S. B. 1870, p. 152, pl. ix. fig. 4.
Bufo penangensis, Boul. Cat. Batr. Sal. p. 287.

This small Toad was discovered by Stoliczka at Penang: he obtained two specimens near the great waterfall, and two in a narrow gorge about halfway up the Penang Hill.

Hab. Malay Peninsula and Borneo.

26. Bufo melanostictus, Schn. (Plate XLIV. fig. 3.)

Bufo melanostictus, Cantor, p. 142; Boul. Cat. Batr. Sal. p. 306; Boul. Faun. Brit. Ind., Rept. p. 505 (fig. p. 506).

Cantor (p. 143) says "in the Malayan countries this species swarms in valleys and hills." Stoliczka (J. A. S. B. 1870, p. 156) mentions this species from Penang, Province Wellesley, Malacca, and Singapore. In the British Museum there are specimens from Penang, Perak, and Singapore. I found this species in abundance at Kulim, Kedah, at Taiping, Perak, in Penang, from within a few yards of the sea to the top of the Hill (2500 ft.), and also in Singapore.

This Toad is very common in the Straits Settlements, hiding by day under stones or logs, in crevices, holes, etc., coming out shortly before sunset, and remaining abroad till dawn; it may be met with on the roads and in the grass hopping or crawling about in search of food—ants, bees, etc. It often utters a rather feeble, plaintive cry when handled for the first time. It can change its colour from a light yellowish-brown to dark brown. Malayan specimens have not so distinct black marks on the ridges of the head and black stars on the tubercles of the back as I have noticed in specimens from the North-West Provinces of India. The males in the breeding-season sometimes have the chin coloured bright yellow. The spawn, which resembles that of *Bufo vulgaris* in England, may be seen in March and April in ponds, in long strings twined about the water-weeds. In April the ponds at Tanglin were swarming with tadpoles, and their margins with minute toads. The tadpoles are very like those of *Bufo vulgaris* both in form, size, colour, and structure of mouth. The largest individual of *Bufo melanostictus* I found was in Penang, and measured 115 mm. from snout to vent.

Hab. India, Ceylon, Sikhim, Himalayas (up to 10,000 ft.), Southern China, Camboja, Siam, Malay Peninsula and Archipelago.

Description of the Tadpole. (Plate XLIV. fig. 3.)

Length of body about once and a half its width and about three quarters the length of the tail. Nostril much nearer the eyes than the end of the snout. Eyes on the upper surface of the body; the distance between them about twice as great as the distance between the nostrils, and about equal to the width of the mouth. Spiraculum on the left side, directed backwards, nearer the anus than the end of the snout, visible from above and from

below. Anus median. Tail from three to four times as long as deep, broadly rounded at the end, both crests nearly equal in depth, upper crest slightly convex and not extending on to back; the depth of the muscular portion of the tail about half the greatest total depth.

Beak white, edged with black. Lips with papillæ only at the sides. In upper lip two series of fine teeth, the upper uninterrupted, the second series nearly as long as the upper one but narrowly interrupted in the middle. In lower lip three uninterrupted rows of teeth, of about equal length, the innermost being rather the longest, and the outermost the shortest.

Colour. Blackish-brown above, grey beneath; muscular portion of tail blackish-brown, crests pale grey.

Size. Length of body 10 mm.; length of tail 12·5; depth of tail 3·5.

The recently transformed young measure from 9 to 11 mm. from snout to vent.

27. BUFO PARVUS, Blgr.

Bufo parvus, Boul. Ann. & Mag. N. H. 1887, (5) xix. p. 346, pl. x.

There were numerous specimens in Mr. Hervey's collection from Malacca, and the types are preserved in the British Museum.

Hab. Pegu, Malay Peninsula, and Sumatra.

28. BUFO QUADRIPORCATUS, Blgr.

Bufo quadriporcatus, Boul. Ann. & Mag. N. H. 1887, (5) xix. p. 347, pl. x. fig. 4; Günther, Ann. & Mag. N. H. 1887, (5) xx. p. 314, pl. xvi. fig. C.

The type specimen was obtained in Malacca and presented to the British Museum by Mr. Hervey. Another specimen has since been given to the Museum by Mr. Wray, who obtained two individuals in Perak, and who says it is rare and inhabits the hills from 800 ft. downwards.

Hab. Malay Peninsula, Sumatra, Borneo.

29. BUFO ASPER, Gravh.

Bufo asper, Günther, Rept. Brit. Ind. p. 423; Stol. J. A. S. B. 1873, p. 113; Boul. Cat. Batr. Sal. p. 313; Boul. Faun. Brit. Ind., Rept. p. 507 (mouth fig. p. 500, vertebral column and pectoral arch fig. p. 499).

Stoliczka found this species in the collection he got from Penang and Province Wellesley; he says the largest specimen was 140 mm. in length. There are specimens in the Raffles Museum, Singapore, labelled "Jelebu" and "Bukit Kedondong, Malacca: 1892."

I only saw this species at one locality, the waterfall in the Botanical Gardens, Penang. In March and April these big Toads may be seen sitting about on the rocks, in the shade, on the edge of the pools of water, seeming to prefer those spots where the air is perpetually damp with the spray from the waterfall. If disturbed they jump boldly into the foaming current. They are

very noticeable animals, the prominent yellow eyes and patch of yellow skin by them showing up distinctly against the black head and back. They are powerful and active, but if caught in the hand will pretend to be dead, lying on their back with the forearms folded on the chest. When alive they smell strongly of musk. The length from snout to vent of the largest Penang specimens was, male 108 mm. and female 165 mm.

Hab. Tenasserim, Malay Peninsula and Archipelago.

Family PELOBATIDÆ.

30. LEPTOBRACHIUM HASSELTII, Tschudi.

Leptobrachium hasseltii, Bouleng. Cat. Batr. Sal. p. 441; Bouleng. P. Z. S. 1890, p. 37.

There is a specimen in the British Museum from Singapore, from Mr. Ridley, and also larvæ from Larut, Perak, presented in 1886 by Dr. J. Anderson.

"Tadpoles of rather large size. These are remarkable in being marked all over with numerous deep black dots. Spiraculum sinistral, equally distant from the end of the snout and from the tail; latter once and a half as long as the body. Length of body 25 mm."

Hab. Burma, Malay Peninsula and Archipelago.

31. MEGALOPHRYS NASUTA, Schl.

Megalophrys montana, var., Cantor, p. 140.
Megalophrys montana, part., Günther, Rept. Brit. Ind. p. 413.
Megalophrys nasuta, Bouleng. Cat. Batr. Sal. p. 443.

Cantor (p. 141) says:—"Two males were at different times captured on the Pentland Hills (Penang), at an elevation of about 1800 ft. One was found in a dark room, where it was observed remaining motionless during several successive days. Its forms and colours caused it at first to be mistaken for a withered leaf. The second was taken on a tree."

Müller (Verh. naturforsch. Gesel. Basel, vii. 1882–85) records a male from Penang in the Bâle Museum. Blanford mentions this species as being in the collection sent by Dr. Dennys from Singapore and neighbouring localities.

There are specimens in the Raffles Museum, Singapore, labelled "Malacca: September 1891," and "Johore." There is a female in the British Museum from Kinta, Perak, from Mr. Wray.

Hab. Malay Peninsula, Sumatra, Borneo.

32. MEGALOPHRYS LONGIPES, Blgr.

Megalophrys longipes, Bouleng. P. Z. S. 1885, p. 850, pl. lv.; Günther, Ann. & Mag. N. H. 1887, (5) xx. p. 316.

Mr. Wray obtained three specimens from the mountains of Perak, at from 3300 to 4400 feet above the sea. It is apparently rare and local. The type is in the British Museum.

Hab. Malay Peninsula.

Order APODA.

Family Cæciliidæ.

33. Ichthyophis glutinosus, L.

Epicrium glutinosum, Günther, Rept. Brit. Ind. p. 441; Stol. J. A. S. B. 1873, p. 113.

Ichthyophis glutinosus, Bouleng. Cat. Batr. Grad. etc. p. 89, pl. iv. fig. 2; Bouleng. Faun. Brit. Ind. Rept. & Batr. p. 515 (figured, p. 516).

Stoliczka mentions this species in the collection he got from Penang and Province Wellesley.

Hab. Mountains of Ceylon, Malabar, Eastern Himalayas, Khasi Hills, Burma, Siam, Malay Peninsula and Archipelago.

34. Ichthyophis monochrous, Blkr.

Ichthyophis glutinosus, var. ?, Cantor, p. 137.

Epicrium monochroum, Günther, Rept. Brit. Ind. p. 443.

Ichthyophis monochrous, Bouleng. Cat. Batr. Grad. etc. p. 91, pl. iv. fig. 1.

Cantor (p. 138) says: "A single individual was observed by Dr. Montgomerie at Singapore in 1863, in whose garden it was turned up with the earth, from about two feet below the surface, and from whom I received the specimen." This is now in the British Museum.

Hab. India (Sikhim, Western Ghauts, Surat, Malabar), Malay Peninsula, Borneo, and Java.

EXPLANATION OF THE PLATES.

Plate XLIV.

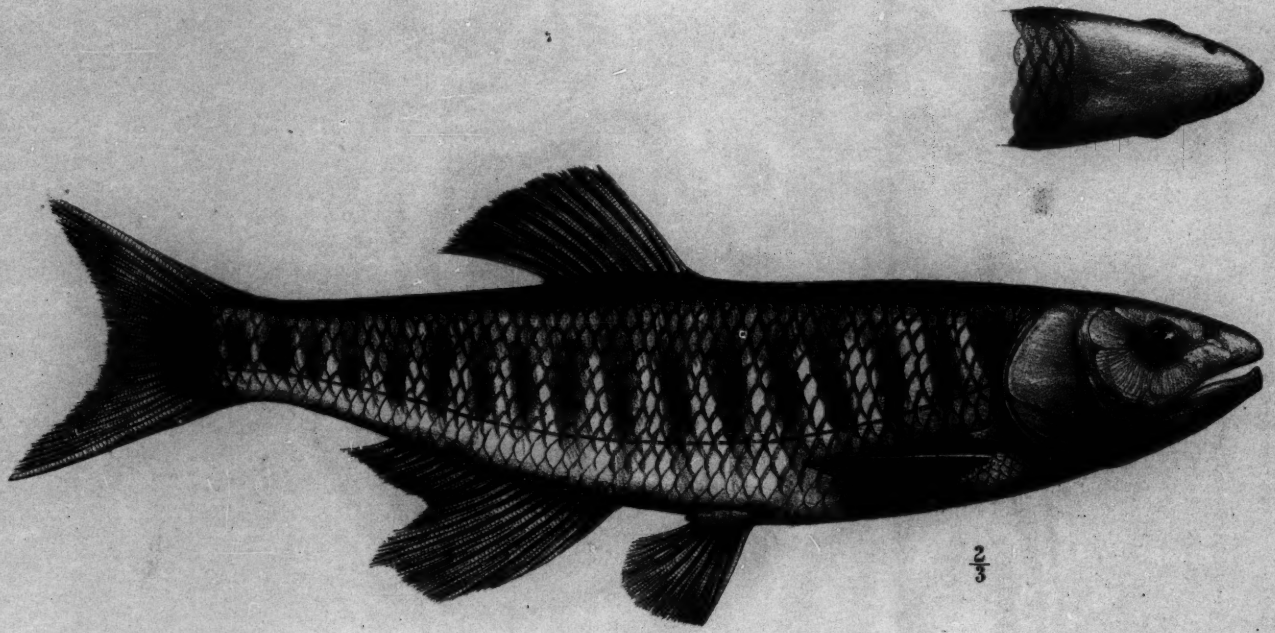
Fig. 1. *Gonatodes penangensis*, S. Flower, p. 863.
Upper and lower view.
1*a*. Anal region, ×2.
1*b*. Lower surface of hand, ×3.
1*c*. " " foot, ×3.
Fig. 2. *Rhacophorus leucomystax*, Gravenh., p. 905.
Tadpole, ×1½.
2*a*. Mouth, ×6.
Fig. 3. *Bufo melanostictus*, Schn., p. 911.
Tadpole, ×2½.
3*a*. Mouth, ×10.

Plate XLV.

Fig. 1. *Rana macrodon*, D. & B., p. 898.
Fig. 2. *Rana erythræa*, Schl., p. 902.
Fig. 3. *Rana labialis*, Blgr., p. 903.
Tadpole, ×1½.
3*a*. Mouth, ×10.

Plate XLVI.

Rana luctuosa, Ptrs., p. 904, with tadpoles at different stages of development. Mouth of tadpole, ×5.



J. Green del. et lith.

BARILIUS GUENTHERI.

Mintern Bros. imp.

2. Descriptions of new Fishes from the Upper Shiré River, British Central Africa, collected by Dr. Percy Rendall, and presented to the British Museum by Sir Harry H. Johnston, K.C.B. By G. A. Boulenger, F.R.S.

[Received October 9, 1896.]

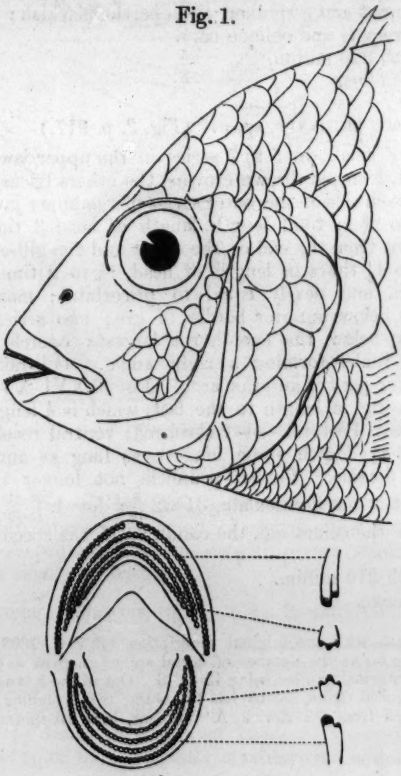
(Plate XLVII.)

The collection made by Dr. Rendall during his recent residence at Fort Johnston comprises examples of 14 species, viz.:—*Chromis mossambicus*, Ptrs., *C. kirkii*, Gthr., *C. squamipinnis*, Gthr., *Hemichromis robustus*, Gthr., *H. modestus*, Gthr., *H. livingstonii*, Gthr., *H. dimidiatus*, Gthr., *H. longiceps*, Gthr., *Labeo coubie*, Rüpp., and five that are new to science and described in this paper.

The specimens are, unfortunately, all in very bad condition.

Chromis rendalli, sp. n. (Fig. 1.)

Fig. 1.



Chromis rendalli.

Most nearly allied to *C. callipterus*, Gthr.[1], with which it agrees in the dentition. 22–30 teeth on each side of the outer series of the upper jaw. Depth of body $2\frac{1}{4}$ to $2\frac{2}{3}$ in total length, length of head 3 to $3\frac{1}{3}$ times. Eye nearly equally distant from the upper lip and the gill-opening, its diameter 4 times in length of head, $1\frac{1}{2}$ times in interorbital width, and equal to præorbital; maxillary not extending quite to below anterior border of eye; four series of scales on the cheek below the eye; large scales on the opercle and on the interorbital region; præopercular limbs forming a right angle. Gill-rakers very short, 8 on lower part of anterior arch. Dorsal XVI 12–13; spines increasing in length to the last, which is $\frac{1}{2}$ length of head. Pectoral pointed, a little longer than the head; ventrals shorter, not reaching the vent. Anal III 9–10; third spine longest, as long as middle dorsals. Caudal rounded (?). Caudal peduncle not longer than deep. Scales rough but not denticulate, 30–32 $\frac{3}{12-13}$; lat. l. $\frac{20-22}{12-15}$. Body without distinct markings; snout and a spot on the opercle blackish; dorsal fin with blackish spots and oblique bars.

Total length 220 millim.

Three specimens.

Oreochromis shiranus, sp. n. (Fig. 2, p. 917.)

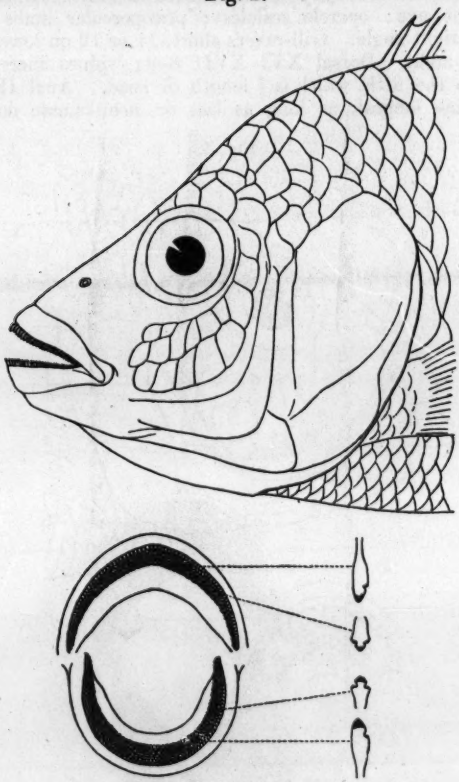
Teeth very small, in 5 to 7 series in the upper jaw, the outer with notched, bicuspid, brown crowns, the others tricuspid; 35 to 47 teeth on each side of the outer series of the upper jaw. Depth of body $2\frac{1}{3}$ to $2\frac{2}{3}$ in total length, length of head 3 times. Eye equally distant from the end of the snout and the gill-opening, its diameter 4 to $4\frac{1}{2}$ times in length of head, $1\frac{2}{3}$ to 2 times in interorbital width, and nearly equal to præorbital; maxillary not extending to below anterior border of eye; two series of scales on the cheek below the eye, lower largest; opercle scaleless; præopercular limbs forming a right angle. Gill-rakers short, 15–18 on lower part of anterior arch. Dorsal XVI–XVII 10–12; spines increasing in length to the last, which is $\frac{1}{2}$ length of head or a little less. Pectoral ——? (broken); ventral reaching vent. Anal IV 9–10; fourth spine longest, as long as and stronger than middle dorsals. Caudal peduncle not longer than deep. Scales rough but not denticulate, 31–32 $\frac{3}{13}$; lat. l. $\frac{20-21}{15-16}$. Nothing can be said of the coloration, the condition of the specimens being too bad.

Total length 210 millim.

Five specimens.

[1] A comparison with the original description (P. Z. S. 1893, p. 623) is misleading in so far as the number of dorsal spines is given as 14, which is exceptional, the normal number being 15 or 16. Out of the 5 type specimens, only the one figured (from Zomba) has 14 spines; two, including the largest specimen received from the Rev. J. A. Williams, have 15 spines; the other two have 16.

Fig. 2.



Orecochromis shiranus.

DOCIMODUS, g. n.

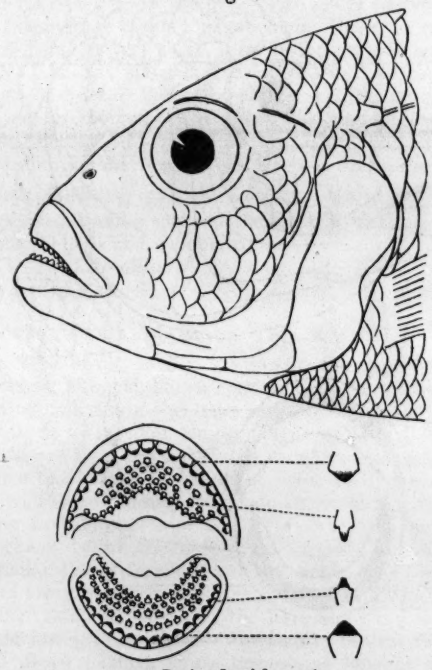
Allied to *Chromis*, but both jaws with a very broad band of teeth with compressed sharp-edged crowns; the outer teeth large, with nail-shaped entire crowns or with a very small lateral cusp, the others small and tricuspid.

DOCIMODUS JOHNSTONI, sp. n. (Fig. 3, p. 918.)

4 or 5 rows of teeth in each jaw; 10 or 11 teeth on each side of the outer series of the upper jaw; crowns brown-edged. Depth of body $2\frac{3}{4}$ to 3 times in total length, length of head 3 times. Eye a little nearer the gill-opening than the tip of the snout, its diameter $4\frac{1}{2}$ times in length of head, $1\frac{1}{2}$ times in interorbital width, and equal to præorbital; maxillary not extending to below

anterior border of eye; 3 or 4 series of scales on the cheek below the eye; opercle scaleless; præopercular limbs forming nearly a right angle. Gill-rakers short, 11 or 12 on lower part of anterior arch. Dorsal XVI–XVII 8–9; spines increasing in length to the fifth, which is $\frac{2}{5}$ length of head. Anal III 9–10; third spine longest, as long as last or penultimate dorsal, but

Fig. 3.



Docimodus johnstoni.

much thicker. Caudal peduncle once and a half as long as deep. Scales slightly rugose, not denticulate, 33–34 $\frac{3}{10}$; lat. l. $\frac{24}{15}$. A black stripe along the posterior half of the body, between the lateral lines; soft dorsal with round dark spots.

Total length 200 millim.

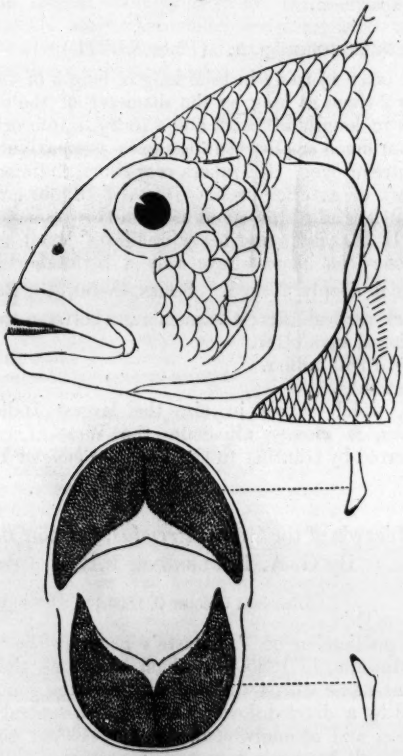
Two specimens.

COREMATODUS, g. n.

Allied to *Chromis*, but both jaws with extremely broad bands of innumerable minute club-shaped teeth with compressed oblique entire crowns.

COREMATODUS SHIRANUS, sp. n. (Fig. 4.)

Fig. 4.



Corematodus shiranus.

Depth of body equal to length of head, $\frac{1}{3}$ total length. Snout very broad, with steep, convex profile; eye a little nearer gill-opening than end of snout, its diameter $4\frac{1}{2}$ times in length of head, twice in interorbital width, and greater than depth of præorbital; maxillary extending to below anterior border of eye; cheek with 4 rows of scales below the eye; opercle and interorbital region scaleless; limbs of præopercle forming a right angle. Gill-rakers moderately long, 12 on lower part of anterior arch, last bifid. Dorsal XVI 10; spines increasing in length to the last, which is $\frac{2}{3}$ length of head. Anal III 8; third spine longest, as long as but thicker than middle dorsals. Caudal peduncle $1\frac{1}{2}$ as long as deep.

Scales slightly rugose, not denticulate, $34\frac{3}{5}$; lat. l. $\frac{20}{5}$. Body with traces of six black cross-bars.

Total length 200 millim.

A single specimen.

BARILIUS GUENTHERI, sp. n. (Plate XLVII.)

Depth of body $4\frac{1}{2}$ to $4\frac{3}{4}$ in total length, length of head 4 to $4\frac{1}{2}$. Snout $1\frac{3}{4}$ to 2 times as long as the diameter of the eye, which is 5 to 6 times in length of head, and 2 to $2\frac{1}{3}$ in interorbital width; præorbital not much smaller than the eye; præmaxillary extending to below centre of eye. Gill-rakers very short, rudimentary, 8 or 9 on lower part of anterior arch. Dorsal I 10, not quite twice as distant from the end of the snout as from the base of the caudal fin. Anal II 18, originating below middle of dorsal, much deeper than the latter, the longest rays only a little shorter than the head. Caudal deeply forked. Scales 48–50 $\frac{10}{4}$. Silvery, with about 15 dark vertical bars; the membrane between the extremity of the last dorsal rays black.

Total length 260 millim.

Three specimens.

This fish, which equals in size the largest Indian species, *Barilius goha*, is closely allied to the West-African *Barilius* recently referred by Günther to the *Leuciscus bibie* of De Joannis.

3. On the Lizards of the Genus *Eremias*, Section *Boulengeria*. By G. A. BOULENGER, F.R.S.

[Received October 9, 1896.]

Since the publication of F. Lataste's paper in the 'Annali' of the Genoa Museum, in 1885—in which he did me the honour of connecting my name with a division of the large genus *Eremias*, characterized by a divided lower nasal shield, ventral shields in straight series, and strongly compressed toes—our acquaintance with these Lizards has made very great progress.

The numerous collections made within the last few years by Révoil, Ragazzi, Robecchi, Ruspoli, Bottego, Donaldson Smith, and Lort Phillips in Abyssinia, Somaliland, and Gallaland, the headquarters of the group, have added greatly to our knowledge of them, not only in showing the doubtful species and variety previously described, and which I had placed in the synonymy of *Eremias brenneri*, Peters, to be entitled to specific rank, but in bringing to light two more species, thus raising their number to five. Having lately received, through the kindness of the Marquis Doria and Dr. Gestro, large numbers of these Lizards, I have availed myself of the opportunity to recast detailed descriptions of all the species. The whole of the material I have worked from is either in the British Museum (specimens marked *) or in the Museo Civico of Genoa.

In addition to the characters mentioned above, all the species of this little group agree in having the head much depressed; the snout pointed; the nasals but slightly swollen; two præfrontal shields; the frontal strongly grooved; three large supraoculars; the lower eyelid scaly; the collar free; the scales on the upper surface of the leg or crus much larger than the dorsals; and one series of very large subcrural plates.

Synopsis of the Species.

I. Upper head-shields smooth or nearly so; femoral pores 15–22.

65–78 scales across the middle of the body; ventrals in 6 or 8 longitudinal series, the outer row, if present, formed of very narrow shields; upper caudal scales strongly keeled; subocular shield usually bordering the lip ... 1. *E. mucronata*, Blanf.

53–60 scales across the middle of the body; ventrals in 8 longitudinal series, the outer narrowest but very well developed; upper caudal scales feebly keeled; subocular not reaching the lip ..... 2. *E. erythrosticta*, Blgr.

II. Upper head-shields rugose or striated.

Upper head-shields rugose or sculptured; 72–82 smooth granular scales across the middle of the body; ventrals in 8 longitudinal series, the outer narrowest but very well developed; upper caudal scales strongly keeled; subocular not reaching the lip; femoral pores 17–22..... 3. *E. smithi*, Blgr.

Upper head-shields coarsely striated; 53–67 keeled scales across the middle of the body; ventrals in 8 longitudinal series, the outer narrowest, but very well developed; upper caudal scales strongly keeled; subocular bordering the lip; femoral pores 13–18 ..... 4. *E. striata*, Ptrs.

Upper head-shields finely striated; 65–68 keeled scales across the middle of the body; ventrals in 6 longitudinal series, an additional outer row, if present, formed of very narrow shields; upper caudal scales striated and strongly keeled; subocular not reaching the lip; femoral pores 20–24 ..... 5. *E. brenneri*, Ptrs.

1. EREMIAS MUCRONATA. (Fig. 1, p. 922.)

Acanthodactylus mucronatus, Blanford, Zool. Abyss. p. 453, fig. (1870).

Eremias mucronata, Günther, Zool. Rec. 1870, p. 71; Bouleng. Ann. Mus. Genova, (2) xii. 1891, p. 9.

Eremias lugubris (non Smith), Vaillant in Révoil, Faun. Pays Çomalis, Rept. p. 23 (1882).

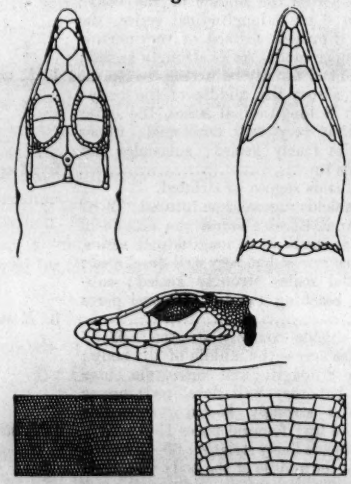
Pseuderemias lineolata, Boettger, Abh. Senck. Ges. xiii. 1883, p. 118.

Boulengeria mucronata, Lataste, Ann. Mus. Genova, (2) ii. 1885, p. 117.

Eremias brenneri (part.), Boulenger, Cat. Liz. iii. p. 86 (1887).

Head once and two-thirds to twice as long as broad. Upper head-shields smooth, or frontoparietals and parietals slightly sculptured; frontonasal as long as broad or longer than broad; anterior supraocular not bordered with granules; interparietal small, separated from the very small occipital by one or two small shields; an elongate shield on the outer border of the parietal; temporal scales granular, smooth; subocular usually bordering the lip, between the fifth and sixth or sixth and seventh, rarely seventh and eighth or eighth and ninth, upper labial shields; the subocular, however, sometimes excluded from the labial border, its

Fig. 1.



Eremias mucronata.

point wedged in between two labial shields; the two or three anterior pairs of chin-shields in contact. Collar with 6 to 12 shields. Dorsal scales granular, flat, smooth, 65 to 78 across the middle of the body. Six or eight longitudinal series of ventral plates, the outer series, if developed, formed of very narrow shields; 25 to 29 transverse series. A large median præanal, sometimes replaced by three smaller shields forming a triangle. The hind limb reaches the eye or between the eye and the nostril; foot as long as the distance between the arm and the nostril or the tip of the snout, or slightly longer; scales on limbs unicarinate. 15 to 22 femoral pores on each side. Tail twice to twice and a half as long as head and body; upper caudal scales strongly keeled. Whitish, pale greyish, yellowish or pale buff above, dotted, marbled, or vermiculate with blackish or rust-red, with a more or less distinct dark, light-edged vertebral stripe; limbs with large dark marblings. Young with five dark dorsal stripes separated by

whitish ones, the vertebral uniform black, the others brown or blackish speckled with white; these markings sometimes persisting in adult females. Lower parts white.

	♂. millim.	♀. millim.
Total length	162	145
Head	14	12
Width of head	7·5	7
From end of snout to fore limb	22	19
" " " vent	50	47
Fore limb	18	17
Hind limb	42	40
Tail	112	98

First discovered by Blanford in the Anseba Valley, Abyssinia, this species has since been found in many localities along the Red Sea, as far north as Suakin and the Sinaitic Peninsula, and in Northern Somaliland.

The following table shows the dimensions and variations in lepidosis and number of femoral pores in the 17 specimens examined. An asterisk indicates that the specimen recorded is preserved in the British Museum :—

	A.	B.	C.	D.	E.	F.	G.	H.	I.
♂. Anseba Valley (type) *.	50	14	7·5	1	6, 7	67	9	25	18–18
" Alali	47	12	8	1	8, 6	71	12	28	16–15
" Beilul *	50	13	8	1	7, 7[1]	70	8	27	19–18
" " *	50	13	8	2	7, 7[1]	78	10	29	19–20
" Walker's Torrent *	46	12	7	1	6, 6	65	10	25	15–16
" Zaila *	45	11·5	7	1	6, 6	72	11	29	22–21
" Berbera *	49	13	8	2	6, 6	66	9	25	19–20
" " *	49	13	8	1	5, 5	70	10	26	18–18
" Laffarugh *	47	12	7	1	6, 5	68	7	25	22–22
" Sinai *	47	12	7·5	1	5, 6[2]	68	8	25	18–18
♀. Alali	46	12	7	1	7, 7[1]	78	7	29	16–16
" "	42	11	6·5	1	6, 6	73	6	28	15–16
" Beilul *	47	12	7	1	7, 7[2]	76	8	27	17–17
" Zaila *	42	11	6·5	1	6, 6[1]	68	7	29	19–19
" Beilul *	30	9	5·5	1	6, 6[1]	75	8	27	17–17
" Berbera *	34	9·5	5·5	1	6, 6	68	7	27	22–22
" " *	34	9·5	5·5	1	6, 6	65	7	26	16–18

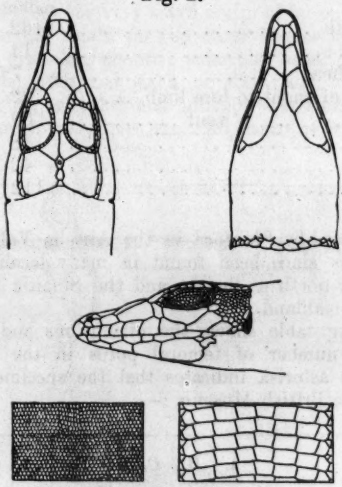
[1] Subocular excluded from the lip on both sides.
[2] Subocular excluded from the lip on one side.

A. Length from snout to vent (in millim.). B. Length of head. C. Width of head. D. Shields between interparietal and occipital. E. Upper labials anterior to the lower border or angle of the subocular (right and left). F. Number of scales across middle of body. G. Number of shields in collar. H. Number of transverse rows of ventral shields. I. Number of femoral pores (right and left).

2. Eremias erythrosticta. (Fig. 2.)

Eremias erythrosticta, Boulenger, Ann. Mus. Genova, (2) xii. 1891, p. 10, pl. i. fig. 2.

Fig. 2.



Eremias erythrosticta.

Head once and two-thirds to twice as long as broad. Upper head-shields smooth; frontonasal longer than broad; three large supraoculars, anterior smallest and in contact with the præfrontal, loreal, and anterior supraciliary, but usually separated from the second supraocular by a series of granules, same as surround the disk formed by the second and third of these shields; interparietal and occipital small, separated from each other by one, two, or three small shields; an elongate shield on the outer border of the parietal; temporal scales granular, obtusely keeled; suboocular not reaching the lip, above the sixth and seventh or seventh and eighth labials; the two or three anterior pairs of chin-shields in contact. Collar with 6 to 9 shields. Dorsal scales granular, round or hexagonal, juxtaposed, keeled, 53 to 60 across the middle of the body. Eight longitudinal series of ventral plates, the six principal broader than long, the outer narrower, but nevertheless very well developed; 24 to 27 transverse series. Præanal region usually covered with several irregular shields disposed in pairs; an enlarged median shield very seldom present. The hind limb reaches the eye, or halfway between the latter and the nostril; foot as long as the distance between the arm and the end of the snout; crural scales feebly keeled. 15 to 20 femoral pores on each side, usually 17 to 19. Tail more than twice as long as head and body; upper caudal scales very feebly keeled.

Adult sandy grey or buff above, with brick-red or black and red dots; tail uniform or spotted with bluish grey and black; lower parts white. Young with five grey longitudinal streaks, which may be broken up by round whitish spots.

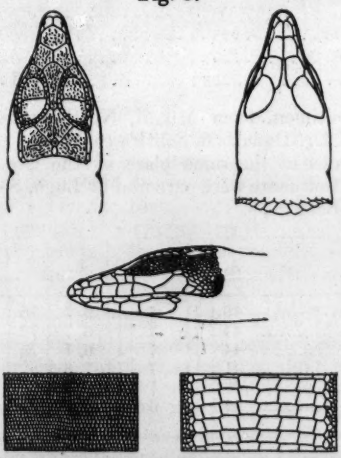
	♂. millim.	♀. millim.
Total length	182	145
Head	15	13
Width of head	9	7
From end of snout to fore limb	21	18
„ „ „ vent	52	47
Fore limb	20	18
Hind limb	41	38
Tail	130	98

This species has only been obtained once, in numerous specimens, in Somaliland, on the route from Obbia to Berbera, by the Italian traveller Robecchi.

3 EREMIAS SMITHI. (Fig. 3.)

Eremias smithi, Boulenger, Proc. Zool. Soc. 1895, p. 534, pl. xxix. fig. 4.

Fig. 3.



Eremias smithi.

Head once and a half or once and three-fifths as long as broad. Upper head-shields rugose, sculptured and pitted, but not striated; frontonasal as long as broad; three large supraoculars, first in contact with second or separate, the second and third forming together an oval disk surrounded with granules which here and there may be in two rows; interparietal usually separated from the occipital by one or two small shields; an elongate shield on

the outer border of the parietal; temporal scales granular, smooth; subocular not reaching the lip, resting on the sixth and seventh, rarely seventh and eighth, upper labials; the two anterior pairs of chin-shields in contact. Collar with 7 to 11 shields. Dorsal scales granular, juxtaposed, smooth, 72 to 82 across the middle of the body. Eight longitudinal series of ventral plates, sometimes with an outer series of smaller, imperfectly developed plates; 26 to 30 transverse series. Preanal region with small shields, or with an enlarged median shield. The hind limb reaches the ear or the eye; foot as long as the distance between the arm and the nostril or the tip of the snout. 17 to 22 femoral pores on each side. Tail twice and one-third to twice and three-fourths as long as head and body; upper caudal scales strongly keeled. Pale reddish brown or brick-red above, with four longitudinal rows of small round white or bluish dark-edged spots; limbs brown, with round pale spots.

	♂. millim.	♀. millim.
Total length	170	146
Head	11	10
Width of head	7	6·5
From end of snout to fore limb	18	17
" " " vent	44	44
Fore limb	16	15
Hind limb	33	32
Tail	126	102

The type specimen, from Milmil, North-western Somaliland, formed part of Dr. Donaldson Smith's collection. Another specimen was obtained at the same place by the late Prince Eugene Ruspoli, whilst four more were purcured at Lugh, Southern Somaliland, by Capt. Bottego.

	A.	B.	C.	D.	E.	F.	G.	H.	I.
♂. Milmil (type) *	46	11	7	...	6, 7	75	7	30	19–19
" "	44	11	7	1	6, 7	72	9	26	20–20
" Lugh	44	11	7	1	6, 7	75	9	28	17–17
" " *	41	11	7	1	7, 8	82	11	26	20–20
" "	40	11	7·5	1	6, 7	75	10	27	22–21
♀. "	44	10	6·5	2	6, 7	74	9	30	18–18

A. Length from snout to vent (in millimetres). B. Length of head. C. Width of head. D. Shields between interparietal and occipital. E. Upper labials below the subocular. F. Number of scales across middle of body. G. Number of shields in collar. H. Number of transverse rows of ventral shields. I. Number of femoral pores (right and left).

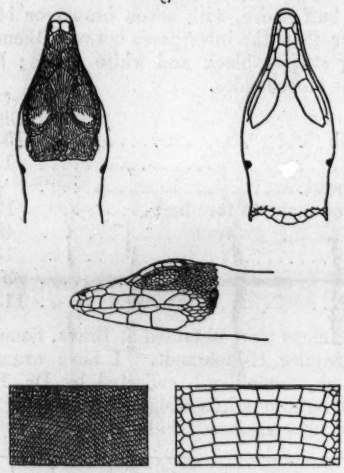
4. EREMIAS STRIATA. (Fig. 4, p. 927.)

Eremias brenneri, var. *striatus*, Peters, Mon. Berl. Ac. 1874, p. 370.

Eremias hochneli, Stejneger, Proc. U.S. Nat. Mus. xvi. 1894, p. 719.

Eremias striata, Bouleng. Ann. Mus. Genova, (2), xvii. 1896, p. 18.

Fig. 4.



Eremias striata.

Head once and a half to once and three-fourths as long as broad. Upper head-shields striated, but more coarsely than in *E. brenneri*, in this respect intermediate between the latter and *E. smithii*; frontonasal a little broader than long; anterior supraocular not bordered with granules, the two others bordered with granules except on their horizontal sutures; interparietal small but much larger than the occipital, from which it is often separated by an additional small shield; an elongate shield on the outer border of the parietal, variable in length and sometimes so short or broken up as to be indistinguishable; temporal scales granular, obtusely keeled; subocular bordering the lip, between the fifth and sixth or sixth and seventh upper labials[1]; the three anterior pairs of chin-shields in contact[2]. Collar with 9 to 12 shields, usually 10 or 11. Dorsal scales rhomboidal, juxtaposed, keeled, 53 to 67 across the middle of the body. Eight longitudinal series of ventral plates, outer narrow; 25 to 28 transverse series. A large median præanal, sometimes followed by another or a pair, the three forming a triangle.

[1] Between the fourth and fifth on one side in one of the specimens described by Peters.

[2] *Eremias hochneli* is founded on a specimen which, in my opinion, represents an individual anomaly in the mental pholidosis, as Mr. Stejneger himself has suggested. The first lower labial meets its fellow behind the symphysial, having fused with the first chin-shield, whilst the third chin-shield has also fused with the corresponding lower labial.

The hind limb reaches the eye, or between the eye and the nostril; foot as long as the distance between the arm and the nostril or the tip of the snout. 13 to 18 femoral pores on each side. Tail twice and a half to three times as long as head and body; upper caudal scales strongly keeled, basal subcaudals smooth. Cream-colour or pale buff above, with seven brown or black stripes as wide as or wider than the interspaces between them; lower parts white. Young striped black and white above; belly black or blackish, at least on the sides.

	♂. millim.	♀. millim.
Total length	155	154
Head	11	10
Width of head	7	6·5
From end of snout to fore limb	17	16
" " " vent	43	40
Fore limb	15	14
Hind limb	34	31
Tail	113	114

The type specimens were obtained at Brava, Somaliland, by the late German traveller Hildebrandt. I have examined 13 specimens from Lugh, Somaliland, collected by Dr. Bottego. The dimensions and variations in scaling and number of femoral pores in these 13 specimens are here tabulated:—

	A.	B.	C.	D.	E.	F.	G.	H.	I.
♂. Lugh	42	11	7	1	6	63	12	26	18–17
" " *	40	10	7	1	6	58	11	25	15–15
" "	40	11	7	...	5	55	10	25	15–15
" "	40	11	7	1	6, 5	57	11	26	14–14
" "	40	11	7	1	5	56	11	26	15–14
" "	38	10	6	...	6	67	10	25	15–14
" "	35	9·5	6	1	5	63	11	25	17–16
♀. " *	40	10	6·5	1	5	65	10	26	15–14
" "	40	10	6·5	...	6	56	11	26	17–17
" "	39	10	6·5	...	5, 6	66	9	27	15–15
" "	39	10	6·5	1	5	53	10	28	16–15
Yg. " *	25	8	4·5	1	5	61	9	26	13–14
" "	23	7	4	1	6	58	10	27	17–18

A. Length from snout to vent (in millimetres). B. Length of head. C. Width of head. D. Shield between interparietal and occipital. E. Upper labial shields anterior to subocular. F. Number of scales across middle of body. G. Number of shields in collar. H. Number of transverse rows of ventral shields. I. Number of femoral pores (right and left).

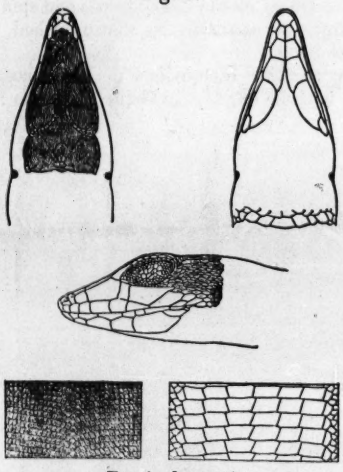
5. EREMIAS BRENNERI. (Fig. 5, p. 929.)

Eremias brenneri, Peters, Mon. Berl. Ac. 1869, p. 432; Bouleng. Cat. Liz. iii. p. 86 (1887) [part.]; and Ann. Mus. Genova, (2), xii. 1891, p. 8; Stejneger, Proc. U.S. Nat. Mus. xvi. 1894, p. 719; Bouleng. Ann. Mus. Genova, (2), xvii. 1896, p. 18.

Boulengerina brenneri, Lataste, Ann. Mus. Genova, (2), ii. 1885, p. 117.

Eremias edwardsii, Mocquard, Mém. Cent. Soc. Philom. p. 115, pl. xi. fig. 1 (1888).

Fig. 5.



Eremias brenneri.

Head once and two-thirds to twice as long as broad. Upper head-shields closely and finely striated; frontonasal as long as broad or longer than broad; anterior supraocular not bordered with granules; interparietal small, in one specimen divided into three, separated from the very small occipital by another small shield; an elongate shield on the outer border of the parietals; temporal scales granular, keeled; subocular not reaching the lip, wedged in between the sixth and seventh upper labials; the two or three anterior pairs of chin-shields in contact. Collar with 7 to 9 shields. Dorsal scales rhomboidal, juxtaposed or subimbricate, keeled, some even tricarinate, 65 to 68 across the middle of the body. Six longitudinal series of ventral plates, with a rudimentary outer series; 25 to 27 transverse series. A more or less enlarged median præanal. The hind limb reaches the eye or the nostril; foot as long as the distance between the arm and the end of the snout; scales on the limbs strongly pluricarinate. 20 to 22 femoral pores on each side (23 or 24 in the types of *E. edwardsii*). Tail twice to twice and a half as long as head and body; upper caudal scales strongly keeled and striated.

In the immature specimen (Obbia-Berbera), examined by me in 1891, the coloration resembles strikingly that of the young *Acanthodactylus boskianus*. Six reddish-white lines along the body, separated by broader black interspaces or stripes, along each

of which runs a series of small round whitish spots; limbs with a black network enclosing large round reddish-white spots; tail striped with black at the base, uniform coralline-red in its posterior half; lower parts uniform white. In the adult female (Brava) now before me the upper parts are of a nearly uniform isabelline colour, with mere traces of the dark stripes and spots of the young, all of which, however, can still be distinguished, and the tail is coloured like the body.

The following are the dimensions of the two specimens described by me; both belong to the Genoa Museum:—

	♀. millim.	Hgr. millim.
Total length	153	155
Head	12	10
Width of head	7·5	5
From end of snout to fore limb	18	14
" " " vent	48	45
Fore limb	18	15
Hind limb	36	30
Tail	105	110

The type specimen came from Brava (*R. Brenner*, one of the companions of C. von der Decken). The types of *E. edwardsi* are noticed simply as from Somaliland (*Révoil*). A single specimen from the Tana River (*Chanler*) has been recorded by Stejneger. I have lately been able to examine two specimens, one from Brava, the original locality (*Bottego*), and one from between Obbia and Berbera (*Robecchi*).

4. On an apparently New Deer from North China, in the Menagerie of the Duke of Bedford at Woburn Abbey.

By R. Lydekker, B.A., F.R.S., &c.

[Received September 10, 1896.]

(Plates XLVIII. & XLIX.)

During a visit to Woburn Abbey in August last, His Grace the Duke of Bedford directed my attention to a large male Deer recently purchased from a dealer, and said to have been obtained from the neighbourhood of Pekin. The animal, although not fully adult, is larger than any example of the Red Deer that I have seen, but appears undoubtedly to belong to the same (*Elaphine*) group of the genus *Cervus*, although its antlers are only in the stage of development permanently characteristic of the *Pseudaxine* group—that is to say, they have but four tines each. At this time the general colour of the fur—which is short, smooth, and glossy—was bright reddish bay, and there was no trace of a light disk on

J.Smit del.et lith. Mintern Bros. imp.

DEER FROM NORTH CHINA.
(IN SUMMER PELAGE)

BRITISH
1 JU 97
MUSEUM

J.Smit del. et lith. Mintern Bros. imp.

DEER FROM NORTH CHINA.
(IN WINTER PELAGE)

BRITISH
1 JU 97
MUSEUM

the buttocks surrounding the tail. The tail is remarkable for its extreme shortness. There was no fringe of long hair on the throat, but this may have been due to immaturity or to season. In their present state of development, no conclusions can be drawn from the antlers. Something over two years may be given as the probable age of the animal.

Such was the coloration of the specimen when I first saw it at the beginning of August (see Plate XLVIII.). When I again visited Woburn in the middle of September, the summer coat was being replaced by the winter one. The most extraordinary change was the development of a large yellowish disk on the buttocks, including all the tail. This disk was clearly produced by a change in the colour of the hairs of the summer coat; but it appeared to be also developing in the winter coat. The general colour of the latter seemed to be bluish grey, or brown, with a tendency to fawn on the neck. A distinct fringe had also developed on the throat. This was very thin, with bands of black, and white tips to the hairs: thus being quite different to the thick, uniformly-coloured fringe of the Wapiti and of the type of *C. luehdorfi*. Still later, the general colour of the coat became more Wapiti-like, and the caudal disk more distinct and brighter (see Plate XLIX.).

From *C. xanthopygus* the Woburn deer appears sufficiently distinguished by the shortness of the tail[1]; while there is no evidence that the former is ever without a caudal disk, or that the summer and winter coats are so widely different. Still, so far as I am aware, that form is only definitely known by the type specimen.

Apparently, the species to which the deer under consideration approximates most closely is *C. luehdorfi*, although it is very difficult to believe that it is identical. The type specimens of *Cervus luehdorfi*, which comprised two pairs, were obtained from Transbaikalia, and were probably brought from the Bureatish Steppe of Northern Manchuria by nomads. The original description[2] runs as follows:—"The Isubra Deer," as it is called, "is intermediate in height between the European Red Deer (*C. elaphus*) and the North-American Wapiti (*C. canadensis*). In size it is closer to the former, in the shape of the antlers to the latter. Its hair is in winter brownish grey, in summer light brown; the throat has a small whitish median streak; the under-lip is whitish, with three black spots, one small one in the middle, and two larger ones on each side. The strong mane is like that of the Wapiti—in colour dark chestnut-brown, in places almost black; in summer it disappears almost completely. The eye is smaller than in the Red Deer. The tail is much shorter than either the Red Deer or the Wapiti; in the male it is only two-thirds of the absolute length of that of the Red Deer; relatively it is much shorter, as the

[1] I assume that Milne-Edwards's plate is correct in this particular. If it be incorrect, and the present specimen turn out to belong to *C. xanthopygus*, that species will be much more distinct from the Red Deer than has hitherto been supposed.

[2] H. Bolau, Abh. Ver. Hamburg, vol. vii. p. 33, pl. iv. (1880).

Isubra Deer is larger. In the female it leaves the pudenda uncovered. The caudal disk is very strongly marked, extending, as in the Wapiti, largely over the base of the tail. In the male it is foxy, but in the other specimens bright straw-yellow. A dark band, extending inferiorly on to the thigh, borders the disk. In both sexes the head is elongated, and the nose somewhat convex. A pair of antlers sent from East Siberia[1] have two forwardly-projecting brow-tines and a middle tine. While the beam goes in a regular curve to end in a terminal tine, there is given off a strong hind-tine, which is likewise single. Wherever tines are given off, the antlers are flattened, and resemble those of *C. eustephanus*, as figured by Blanford[2]."

It is added that the young are spotted, and it is suggested that the species may prove identical with *C. eustephanus* of the Thian-Shan.

From this description it appears that *C. luehdorfi* has a well-marked caudal disk at all seasons, and this is certainly the case with the nearly allied Wapiti, whereas in the Woburn deer the summer coat in the second year is uniform. The colour of the summer coat is also much redder than in the Wapiti, and, apparently, than in *C. luehdorfi*. Then, again, the neck-fringe, in the present condition of the animal, is quite different to both the others. Moreover, the appearance of the deer is not quite that of a Wapiti, although it seems to belong to the same group. Further comparisons cannot be made till the antlers of the third year are developed; and it is, therefore, with some hesitation that I give the animal a name at this time, especially as it inhabits an area not very far removed from that of *C. luehdorfi*. Still, I have the support of Mr. A. D. Bartlett, who saw the specimen in August, and regarded the Woburn deer as undoubtedly representing a new species. In the event of its proving decidedly distinct, the name of *Cervus bedfordianus* would be appropriate, and this name I accordingly assign to it provisionally.

Whether of individual or of specific value, the late development of the caudal disk in the summer coat of the second year is certainly a very remarkable feature; and this feature, together with the bright chestnut-red colour of the coat at the same season, must be regarded as one of the most distinctive peculiarities of this deer. In the winter coat the narrowness and banded coloration of the throat-fringe must likewise be noted as a well-marked feature. Beyond this it is almost impossible to go at present in attempting to define the presumed species.

It is quite clear that the specimen has nothing to do either with *C. davidianus* or with the *Pseudaxine* group.

The following list of the known species of Elaphine Deer, with a few of their leading distinctive characteristics, may be found useful in connexion with the foregoing notes:—

[1] Figured in the original memoir of Dr. Bolau.
[2] Proc. Zool. Soc. 1875, p. 638.

A. Antlers cupped, normally with a bez-tine.

1. *C. elaphus.* Europe to Asia Minor and N. Africa. In the Barbary form the bez-tine generally wanting. Tail long.
2. *C. maral.* Caucasus, Carpathians, and Eastern Persia. Face longer than in Red Deer, and antlers generally simpler; but probably only a larger form of that species.
3. *C. xanthopygus.* Typically from Northern China. Not fully defined from No. 1; and part of its area perhaps belonging to other species.

B. Antlers normally not cupped.

a. Antlers with a bez-tine; muzzle and chin dark, or not pure white.

4. *C. cashmirianus.* Kashmir. Antlers usually with five, but sometimes more tines, of which the bez generally exceeds the brow in length; in form regularly curved. Caudal disk generally small, and white, but occasionally wanting. Tail short. Colour brown or brownish-ash.
5. *C. yarcandensis.* Yarkand. Closely allied to last.
6. *C. affinis.* East of Sikhim and Darjiling. Differs from *C. cashmirianus* in the beam of the antlers being much bent forward above the origin of the trez-tine; bez-tine sometimes larger than the brow, but less constantly than in *C. cashmirianus.* Only five tines to antlers, which are very large. Caudal disk well developed.
7. *C. eustephanus.* Thian-Shan and Altai. Closely allied to the Wapiti, from which the antlers appear inseparable, although the legs are shorter.
8. *C. luehdorfi.* N. Manchuria. Doubtfully distinct from the last. Grey in winter, brown in summer.
9. *C. canadensis.* Antlers curving backwards, but slightly converging, and much flattened where the tines divide; the fourth tine very large, and the posterior terminal tine also large and directed backwards, nearly in the plane of the fourth. More than five tines. Caudal disk very large, and throat-fringe greatly developed; neck dark-coloured. Tail very short; face short.
10. *C. bedfordianus.* N. China. Allied to last, but smaller and more slenderly built. Summer coat uniformly foxy; winter coat dark brown, with large yellow caudal disk; throat-fringe thin and particoloured in autumn.

b. Antlers without a bez-tine; muzzle and chin pure white.

11. *C. thoroldi.* Tibet.

In conclusion, I may take this opportunity of mentioning that in the Park at Woburn there is a small herd of Wapiti-like deer from the Altai, which I believe to be referable to *C. eustephanus* of the Thian-Shan. Unfortunately, their antlers have been so damaged by the voyage, that they are valueless for purposes of comparison; but the general appearance of these animals leads one to think that they belong to the species in question. The big Deer of the Altai have been generally referred to the so-called *Cervus maral*, probably owing to the use of the term "Maral" by the natives of Central Asia. Mr. W. L. Sclater[1] has, however, already pointed out that the Altai deer is in all probability identical with the Thian-Shan stag. Accepting this identity, and also that *C. luehdorfi* is specifically inseparable from *C. eustephanus*, the range of the latter species will extend from the Altai to Amurland, and will thus lead on towards the habitat of the Wapiti. These Altai deer appear to be distinctly different from *C. bedfordianus*.

Next year I hope to be able to give some further observations on the Altai deer at Woburn.

5. On the Habits of a Cuckoo in the Gilbert Islands.

By Alfred J. North, C.M.Z.S., Ornithologist to the Australian Museum, Sydney.

[Received August 19, 1896.]

At a meeting of the Linnean Society of New South Wales, in September 1894, I exhibited a male and female of the Long-tailed Cuckoo, *Eudynamis taitensis*, which had been recently presented to the Trustees of the Australian Museum by the Hon. C. R. Swayne, H.B.M.'s Resident at the Gilbert and Ellice Groups. These birds had been obtained by Mr. Swayne on Big Makin Island or "Butari-tari" of the natives. A short note was also contributed relative to the distribution of this species, and to the tradition current among the natives of the Gilbert Group, that the female deposited her egg on a piece of palm-leaf placed on a cloud, and left it to be incubated by the sun[2].

During June of this year Mr. Swayne, who was in Sydney for a short time while on his way to London, informed me that he had seen this Cuckoo oust a Noddy Tern (*Anous stolidus*) from its nest and take possession of it. As the habits and food of these birds are so entirely different, and as I had never previously heard of so remarkable an instance of appropriation on the part of a Cuckoo, Mr. Swayne, prior to his departure, kindly sent me the following notes:—

[1] Cat. Mamm. Indian Mus. pt. ii. p. 184 (1891).
[2] See Proc. Linn. Soc. N. S. W. ser. 2, ix. p. 584.

"I promised to write you as to the 'Tekabare' (*Eudynamis taitensis*), of which I sent you specimens in 1894.

"This bird is found in both the Gilbert and Ellice Islands, and is, I believe, the only land-bird in the Gilberts, whereas in the Ellice Islands a large light slate-coloured Pigeon[1], known in Fiji as the 'Thireke,' is also found.

"During the latter part of my stay in the Gilberts, I was always on the look-out for information as to the nesting of the 'Tekabare,' but was unable to get any from the natives.

"In August last year I was at the island of Niu, in the Ellice Group, and while walking through the island along with the local trader we passed a clump of 'buka' trees, in which, as is common throughout the Ellice Islands, there were numbers of the Noddies (*Anous stolidus*) nesting. I noticed that in one tree the birds were much disturbed and apparently frightened. The trader explained that the birds were disturbed by a 'Hawk.' We remained some time watching, and I saw our friend the Cuckoo drive a Noddy out of the nest and take possession of it, while the old birds and apparent proprietors tried in vain to dislodge the intruder. The trees were high with long bare boles, impossible to climb, and if climbed it would be difficult to get at the nests, as the wood is soft and the branch on which the nest was built was insufficient to bear one's weight.

"I do not doubt that the Cuckoo was about to lay. As there are no 'buka' trees in the Gilberts, the Cuckoo doubtless lays in the Noddy's nest on the pandanus.

"I have often watched the Noddy in the Gilberts picking up grass and bits of coconut leaves and making its nest, which when finished very much resembles that belonging to a land-bird. It would be interesting to know whether the young Cuckoo is raised on a fish-diet.

"Although I offered rewards to the natives on many islands, I never was able to get an egg of the Cuckoo. In the Gilberts the people say they have never seen eggs or young, and, as I told you, they hold the tradition that the female takes a portion of the covering of the young palm-leaf and flying up with it deposits it on a cloud, lays her egg on it, where it is hatched by the sun.

"At the island of Funafuti, where the scientific expedition now is, the Cuckoo may be seen at the back of the town, and there are probably half a dozen birds in the atoll. Both the Noddy and the Man-of-War bird are kept as pets in the Ellice and Gilbert Islands, but I could never find that the Man-of-War bird was (as has been stated) used to carry messages between different islands. The old men always laughed at the idea."

[1] Probably *Globicera pacifica*.

6. On the Development and the Species of the Crustaceans of the Genus *Sergestes*. By Dr. H. J. Hansen (Copenhagen)[1].

[Received October 15, 1896.]

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i. *Introductory Remarks.*

Three years ago the Rev. T. R. R. Stebbing, in his most useful book "A History of Crustacea. Recent Malacostraca" (The Intern. Scient. Ser. vol. lxxiv.), writes on the genus *Sergestes*:—"The species known as adults are very numerous, of very various sizes . . . . . The account of the genus occupies eighty-eight quarto pages and seventeen plates of Spence Bate's 'Report on the *Challenger* Macrura.' It was the subject of a monograph by Kröyer in 1856, and the interest of the subject seems still very far from being exhausted." That the supposition in the last line of this quotation is correct will be proved by this little treatise. Besides the large section of Bate's 'Challenger Macrura' and Kröyer's monograph, almost a score of papers contain contributions to the knowledge of this interesting genus; but for all that no other group or extensive genus of Decapoda has been up to this time so incompletely studied. This will be plainly recognized when the chief results of this paper are stated—*these are that of the* 59 (*or* 60) *hitherto described species only about* 20, *or one-third of the total number, have been established on adult animals, such as have almost or entirely arrived at sexual maturity; and that almost all the other species are true larvæ, and even of these a considerable portion are larval stages of species already established on adult specimens, while of the* 20 *species founded on adult specimens* 2 *with good reason will be excluded and at least* 4 *must be cancelled as synonyms*! The authors, who have established new species and have avoided describing or at least acknowledging larvæ as real adult species, only make mention of large or very large specimens and, in all probability, have not studied smaller forms.

To throw some light upon the older larval stages of the species, distinguishing between the larvæ and the adults, referring a series of the larvæ to the adult forms, examining the value and variation of different characters, &c., will be the aim of this short treatise.

[1] Communicated by the Rev. T. R. R. Stebbing.

Several years ago, when trying to determine the very rich material of pelagic forms (among them also the type specimens of the 15 species described by Krøyer) preserved in the Zoological Museum of the University in Copenhagen, I discovered the value of numerous species, but I had no mind to write any preliminary note on the question. Since then I have not had the time necessary for working out a monograph (requiring some hundred figures); but seeing now that at least during some years I shall be very much engaged with other work, while authors continue to describe larvæ as well-established new species, I have thought it convenient to write this communication. A monograph will, nevertheless, be extremely desirable, for of most species and larval stages new full, and accurate descriptions and new figures, much better than the existing ones, must be worked out. Many of the described forms it is impossible to recognize with certainty without a re-examination of the type specimens. A monograph must also be based upon the investigation of the collections in the few museums which possess rich material of pelagic Crustacea; it will be rather toilsome, but very remunerative, as at the present time it is scarcely possible within any other group of Decapoda to elucidate a large portion of the development of almost two-thirds of the species.

The genus *Sergestes* is now generally referred to a separate family, the *Sergestidæ*. To this also the following genera have been transferred: *Sciacaris*, Bate; *Petalidium*, Bate; *Acetes*, H. M.-Edw.; and *Leucifer*, Vaugh. Thomps. On *Sciacaris* and *Petalidium* some remarks will be communicated in the following pages; the two other genera I must omit on this occasion, though much addition to our knowledge could be given. *Leucifer* has been treated at great length by Bate, who admits only 2 species, but 4 species are preserved in our museums. Of *Acetes* 2 species are known (one of which has not been examined since 1837), but we possess 6 species, the distinctive characters of which are very curious; it is, however, impossible to give a good idea of the species of these two genera without a considerable number of figures.

Before concluding these few remarks I desire to offer my sincere thanks to Prof. Dr. K. Brandt (Kiel) and Geheimrath Prof. Dr. R. Leuckart (Leipzig), who lent me two type specimens, and especially to Geheimrath Prof. Dr. V. Hensen (Kiel), who lent me examples of 4 Plankton species, and Prof. Dr. C. Chun (Breslau), who, on my request for the loan of type specimens of two species, favoured me with his whole finely preserved material collected by himself, chiefly with a closure-net, "Schliessnetz," at the Canary Islands and at Ragusa and Lesina in the Adriatic.

ii. *The History of the Genus.*

As C. Spence Bate and A. Ortmann, the last two authors who have given an apparently but not really complete enumeration of the known species, have overlooked several publications, and as

other contributions have been published during the last few years, it will be convenient to give a short account of all the papers containing descriptions of new species, and, moreover, to make some few remarks on the most important contributions treating of the development. Papers which contain no descriptions of new species, and generally are but of little interest for our knowledge of the genus, are omitted.

The genus *Sergestes* was established by H. Milne-Edwards in 1830 ("Descr. d. genres Glaucothoë, Sicyonie, Sergeste et Acète," Ann. d. Sc. Natur. t. xix.) with one new species, and in his Hist. Natur. d. Crust. t. ii. 1837, he does not know more species.—In 1850 G. de Natale (Descriz. zool. d'una nuova specie di Plojaria et di alcune Crostacei del porto di Messina) described and figured one new species.—In 1855 H. Kröyer published preliminary descriptions ("Bidrag til Kundskab om Kræbsdyrslægten *Sergestes*, Edw.," Overs. K. D. Vidensk. Selsk. Forhandl. i 1855) of 15 new species, and in 1859 his well-known monograph ("Forsög til en monographisk Fremstilling af Kræbsdyrslægten *Sergestes*, Med. Bemærkninger om Decapodernes Höreorganer," K. D. Vidensk. Selsk. Skrifter, 5 Raekke, Nat. Math. Afd. iv. 2) containing full descriptions and numerous figures of the same 15 species. The descriptions are worked out with his usual care, and both these and the plates surpass almost all subsequent contributions; but his scanty material of most species and complete ignorance of the development have given rise to the error, at that time very excusable, of treating larvæ as adult species. Of corrections I shall only here mention that 3 of his species do not belong to the genus (see later on); and that when he states that the examples of *S. serrulatus*, *S. caudatus*, and *S. laciniatus* were captured in the Kattegat off Denmark, this is absolutely a mistake, all 3 species originating in the subtropical or tropical seas.—In 1861 W. Stimpson published ("Prodrom. descr. animal. evertebr., quae in Exped. ad Ocean. Pacific. Septentrion. . . .," Proceed. Acad. Nat. Sc. Philadelphia, 1860) shorter descriptions of 5 new species, one of which he transferred to a new genus, *Sergia*, which must be cancelled as being of no value at all.—In 1875 A. Metzger ("Crustaceen aus d. Ordnungen Edriophthalmata und Podophthalmata," Jahresber. der Commission zur wiss. Unters. der deutschen Meere in Kiel für die Jahre 1872, 1873: Berlin, 1875) established one new species.—In 1881 C. Spence Bate published ("On the Penæidea," Ann. & Mag. Nat. Hist. ser. 5, vol. viii.) preliminary descriptions of 4 new species (and of the new genus *Petalidium*), all from the 'Challenger'; the paper is of some importance for the priority of at least one of the names. In 1888 Bate's above-mentioned large contribution in the 'Challenger' Report, vol. xxiv., was issued. Together with the species in the preliminary paper he describes in all 24 new species of *Sergestes*, but figures only 18 of them; next he gives an extract of the Kröyerian descriptions and a new representation of 7 of Kröyer's species examined by himself. He indicates "Greenland" as the

locality for all the animals described by Kröyer, though only one of Kröyer's species was taken in that neighbourhood—a curious mistake which has already been corrected by Ortmann. He cancels 2 of Kröyer's species, but one of the two, *S. arcticus*, is a valid species. Bate also employs numerous pages and several plates in the representation of larval stages (see later on). This large contribution is of course of great importance, but unfortunately neither the descriptions nor the figures are so good as could be wished, and in numerous instances (see later on) a re-examination of the type specimens is absolutely necessary—the greater part of the new species are but larvæ. Besides the genus *Petalidium* he also establishes the genus *Sciacaris*, each of these containing one species. The latter genus is of no value, it is but a *Sergestes*-larva.—For some small but classical contributions we are indebted to S. I. Smith. In 1882 he gives ("Report on the Results of Dredging, und. the supervis. of Al. Agassiz . . .," Bull. of the Mus. of Compar. Zool. vol. x.) the correct branchial formula of *S. arcticus*, Kr., and an excellent description with good figures of a new species; in 1884 ("Rep. on the Decap. Crust. of the Albatross Dredgings . . . in 1883," U. S. Comm. of Fish and Fisheries, pt. x.; Rep. f. 1882) he describes a new species and gives figures of *S. arcticus*, Kr., and *S. robustus*, Smith; in 1886 ("Rep. on the Decap. Crust. . . . in 1884," U. S. Comm. of Fish and Fisheries, pt. xiii.; Rep. f. 1885) he communicates a plate with figures of earlier described species.—In 1888 C. Chun ("Die pelag. Thierwelt in gröss. Meerestiefen . . .," Bibliotheca Zoologica, B. 1) describes and figures one new species, captured with a "Schliessnetz," and in 1889 ("Bericht üb. eine nach d. Canarischen Inseln im Winter 1887–88 ausgef. Reise," Sitzungber. d. k. Preuss. Akad. d. Wissensch. zu Berlin, Jahrg. 1889) another and very curious new species.—In 1891 J. Wood-Mason ("Nat. Hist. Not. from H.M. Indian Marine Survey Steamer 'Investigator,'" Ann. & Mag. Nat. Hist. 6th ser. vol. vii. 1891 and vol. viii. 1891) establishes two new species; and, as a continuation of the same publication, A. Alcock and A. R. Anderson in 1894 (Journ. Asiat. Soc. of Bengal, vol. lxiii. 1894) describe a third new species, of which a figure was published later on, in 1895 (Illustrations of the Zool. of the R. Ind. Mar. Surv. Steamer 'Investigator': Calcutta 1895).—In 1893 A. Ortmann ("Decapoden und Schizopoden," Ergebnisse d. Plankton-Exped. d. Humboldt-Stiftung, B. ii. G. b.) gives a more important contribution, containing descriptions and figures of 2 new species, additional notes and corrections on several earlier known species, and the cancelling of 3 names as synonyms; he also tries to make up an analytical key of most of the known species, distributing them into the genera *Sergestes* and *Sergia*, but as the greater part are larval forms with several of the characters changing from stage to stage, the keys are of no value.—Finally W. Faxon in 1893 ("Prel. Descr. of new Spec. of Crust.—Rep. on the Dredg. Operat. off the West Coast of Centr. America . . .," Bull. of the Mus. of Compar. Zool. vol. xxiv.) describes 3 new

species. In the full treatment ("The Stalk-eyed Crustacea.—Rep. on an Explor. off the West Coast of Mexico . . .," Mem. of the Mus. of Compar. Zool. vol. xviii. 1895) he communicates extensive descriptions and a series of figures of the same 3 species, but he withdraws 2 of them as synonyms to earlier known forms; one of these, *S. halia*, must, however, be re-established.

The result is that of *Sergestes* and *Sergia*, taken together, 59 species have been established, of *Sciacaris* 1—in all 60 species, of which 7 have been withdrawn by various authors, but only 5 with good reason; so that we have the preliminary result: 55 species.

The development of *Sergestes* was first and most fully elucidated by C. Claus. In 1863 ("Ueber einige Schizop. und niedere Malacostraken Messina's," Zeitschr. f. wiss. Zool. B. xiii. 1863) Claus describes a larva which he names *Acanthosoma*, without, however, being able to indicate its relations; but he (pp. 437–439) correctly refers *Mastigopus*, Leuckart (1853), to a larva of *Sergestes*. In 1876 (Untersuch. zur Erforschung der Geneal. Grundlage des Crustaceen-Systems) he shows all the principal features of the metamorphosis: he has found a *Protozoëa*-stage, and states the zoëa described by Dohrn as *Elaphocaris*, *Acanthosoma*, and *Mastigopus* to be successive stages of the development. One point is of special interest, viz. his statement that the two posterior pairs of trunk-legs, which are well developed with long exopods in the *Acanthosoma*, are thrown off by the moulting to the *Mastigopus*-stage, and then grow out again; they become "sichtbar als kurze Schlauche, die wir an grösseren und älteren Larven in verschiedenen Uebergangsstufen zu kleinen Füssen sich entwickeln sehen" (Zeitschr. w. Zool. p. 438).—Some months before the "Untersuchungen" of Claus appeared v. Willemoës-Suhm published ("Prelim. Remarks on the Development of some Pelagic Crust.," Proc. Roy. Soc. Lond. vol. xxiv. 1876, and Ann. & Mag. Nat. Hist. ser. 4, vol. xvii.) a short paper, in which he states that *Elaphocaris*, Dohrn, is the zoëa of *Sergestes*, and that the development passes through an *Amphion*-stage &c.; but on the *Mastigopus*-stage and its want of the two posterior pair of trunk-legs he says nothing.—In Bate's 'Challenger' Report 30 pages and several plates are occupied by the representation of a series of *Elaphocaris*, *Acanthosoma*, *Mastigopus*, and considerations about the development. On p. 383 he says: "By tracing the several stages, we may safely conclude, from the direct structural affinities, that *Mastigopus* is a young *Sergestes*." This is correct, but when he really tries to establish any limit between *Mastigopus* and *Sergestes* he is not fortunate, nay, in the description of *Serg. longispinus*, Bate (pp. 417–18), he even writes: "The fourth and fifth pairs are entirely absent," and later on he is "inclined to think that their absence is owing to the early stage of development"; thus his *Serg. longispinus* is a young *Mastigopus* with the legs referred to still less developed than in the form he in the earlier part (pp. 376–77) describes as *Mastig. acetiformis*, Bate. Thus the differences

between *Mastigopus* and *Sergestes* have not been apprehended by Bate.—In 1893 A. Ortmann (in his above mentioned paper) gives a general view of the development of *Sergestes*; on p. 68 he says that the reduction of the two posterior pairs of trunk-legs in *Mastigopus* "ist der hauptsächliche Unterschied von der erwachsenen *Sergestes*-Form," which in this draught is rather obscure, and this author has also accepted the larvæ described by his predecessors as adults, as being valid species of *Sergestes*.

iii. *The adult* Sergestes *and* Mastigopus.

No author has put or answered the question how to decide whether a specimen of a *Sergestes* is really adult. At first sight this does not seem to be the case. Long ago Milne-Edwards discovered an organ only found in the adult (or subadult) male, viz. a large and very complicated appendix on the first pair of pleopods, the so-called "petasma," and Krøyer added the peculiar development of the exterior flagellum of the antennulæ. Later on Bate, Smith, Wood-Mason, and Faxon have found similar structures in some species. But it is interesting to observe that all the species in which these structures have been found, or, in other words, the species of which the male sex has been determined, are comparatively large, at least 15–25 mm. in length and sometimes much longer, that they all possess short eye-stalks with rather small or very small and *totally black eyes*, and that they have the fifth pair of trunk-legs tolerably developed and the fourth pair rather long and fringed with numerous long cilia; while in most of the described species no petasma and no transformation of the exterior flagellum of the antennulæ have been found, and all these species are rather small, rarely more than 4–15 mm. long, almost all with rather long or long eye-stalks, rather large or large eyes, all with the eyes *either totally yellowish* (or whitish) *or at most with a blackish spot in the interior*, and the fourth and especially the fifth pair of trunk-legs rather short or even rudimentary. When Krøyer published his monograph the development was quite unknown, and not being able to find any male specimen of numerous species he believed that his specimens were females. Bate and Ortmann, who later on studied collections many times richer than that examined by Krøyer, do not mention having met with any male of any of the numerous smaller species! These results suggest that the smaller species must offer some peculiarity.

The collection of *Sergestes* in the Zoological Museum of the University in Copenhagen is very large, 300 bottles and tubes (each containing all the specimens of a species from the same locality); all the animals, with extremely few exceptions, have been collected with surface-nets. Trying to discriminate and determine the forms, I soon took notice of the fact that among an enormous material (98 tubes) of *S. atlanticus*, M. Edw., with black eyes, not rarely were found somewhat smaller specimens with pale or

yellowish eyes, which possessed a shape recalling somewhat the very curious, ovate, and obliquely implanted, but much larger eyes in *S. ancylops*, Kr. The result of further comparison was that *every conceivable intermediate stage between the small* S. ancylops, *Kr.* (with its abnormal eyes, its rudimentary last pair of trunk-legs, and its dorsal spines on some of the abdominal segments, &c.), *and large, mature specimens of* S. atlanticus, *M.-Edw.* (S. frisii, *Kr.*), *was found*. We possess *S. ancylops* from 17 localities, and in 10 of these it was taken in company with larger transition-stages to, or completely developed specimens of, *S. atlanticus*. That typical specimens of *S. ancylops* and transition-stages to the black-eyed form do not possess any petasma, scarcely needs mention, but neither was it found in the smallest of the black-eyed specimens. The result was that *S. ancylops*, Kr., must be considered as the *Mastigopus*-stage of *S. atlanticus*, M.-Edw., and that the idea of *Mastigopus* must be extended to embrace such stages as only differ from the *Mastigopus* of Claus, Bate, and Ortmann in having the fourth and fifth pairs of trunk-legs somewhat longer, while their eyes in shape and colour have still preserved the essential characters of the *Mastigopus*. And with that I had gained a result rendering it easy to study the alterations in shape and armature of all the various parts of the animal during its development, and a starting-point for the consideration of other species. Soon afterwards I made out that *S. rinkii*, Kr., is the *Mastigopus* of *S. arcticus*, Kr., &c. And now let us look at the characters of the larvæ in contradistinction to those of the adult animals.

When a species is mature the male sex always possess a large petasma and—so far as we know—a peculiar development of the exterior flagellum of the antennulæ. For the females I have not found any character of discriminative value. But while the well-developed petasma is necessary to decide the real maturity of the male, and the female must have reached the same length as the adult male before it can be admitted as being mature, *such comparison is not necessary for the decision of the question whether a specimen without a petasma has arrived at the adult stage—viz. that its different parts, such as shield with rostrum, eyes, external maxillipeds and legs, uropods, telson, &c. have almost or totally assumed the shape to be found in the mature and sometimes unknown form—or whether it must be considered as a larva*. As declared in the introductory remarks, about two-thirds of the established species are but larvæ; in reality they present several characters immediately stamping them as such, and, furthermore, they show peculiarities which indicate very different stages of metamorphosis. In a multitude of "species" dorsal spines on some or almost all the abdominal segments are present, and such spines only exist in the larval stages, but in many older larvæ the abdomen is quite smooth. In the adults the rostrum is rather short or very short, but, especially in the younger *Mastigopus*-forms, it is most frequently long or even very long. In the larvæ the fourth and fifth pair of

legs are at least shorter, more slender, and with fewer hairs than in the adults. But the best distinction between the larvæ and the adults is, as hinted above, the shape and especially the colour of the eyes: in the larvæ the eye-stalks are almost always long, the eyes are rather large, or even very large, and have an oblique and more or less fungiform shape; while in the adults the eye-stalks are rather short, and the eyes smaller, more regularly globular, and sometimes but slightly thicker than the distal end of the stalk; *in all larvæ the eyes are yellowish (or whitish), and black pigment, when present, is only found in the interior and very remote from the cornea, while in the adults the eyes are totally black.* But it must be emphasized that even when the black eyes are acquired and all other larval characters have been lost, the animals are still immature, as the petasma is developed somewhat later, and the petasma itself does not become completely developed at once to its final shape.

For the rest, more or less conspicuous alterations in all parts of the body and the limbs take place during the development from the youngest *Mastigopus*-stage to the adult *Sergestes*, but it is impossible to give a full elucidation without numerous figures. Besides, the species show considerable differences in development: thus, for instance, the dorsal abdominal spines are in some species lost when the *Mastigopus* is not half-grown, while in other species they are preserved till the *Mastigopus* is almost full-grown and the colour of the eyes alters, &c. Therefore I do not attempt to give a general picture of the metamorphosis, but I will refer the reader to the following more special, but short treatment of the species.

Next we arrive at three fresh considerations: (1) the separation of the adult species from each other; (2) the discrimination of the larvæ, so that the different stages of the same *Mastigopus* may be referred to each other and separated from other larvæ; and (3) the reference of any given *Mastigopus* to its species of *Sergestes*. In the literature of the subject numerous characters have been used, but some of them are only applicable to the adults, others to the larval forms, and several good characters proposed by Krö er and S. I. Smith have been overlooked, or at least not used with sufficient accuracy, by most authors. The whole question of the characters must be re-examined.

For the characterization of the adult species must be used differences in the following structures:—the shape of the rostrum, absence or presence of supra-ocular spine, hepatic spine, and gastro-hepatic groove on the carapace, shape and size of the eyes, the relative length of the 3 joints of the antenn. ped.[1], their size, and the shape of the basal one, the shape of the apical part of the squama, the length and structure of mxp.[3] (whether the 4 proximal joints are similar to those in trl.[3] or are obviously incrassated, the arming

[1] In order to abridge the descriptions, I in the following pages make use of some abbreviations:—antenn. ped.=peduncle of the antennulæ, mxp.[3]=the third pair of maxillipeds, trl.[1]-trl.[5]=the first to the fifth pair of trunk-legs, ext. br. of urp.=external branch of the uropods.

or furnishing with setæ or spines of the two distal joints, and the division of the sixth joint into 4, 5, 6, or 8 subjoints, &c.), the number and size of the branchiæ or lamellæ above trl.^{3} and trl.^{4}, the difference in shape and the furnishing with cilia along the exterior margin of ext. br. of urp., finally sometimes the coarseness or slenderness of the body. *Especially mxp.*^{3} *offers most valuable and very neglected differences.* (Of course it will also be possible to detect good characters in other parts, f. inst., in the structure of the 5 pairs of trunk-legs, and one difference is used in the following discussion; the petasma also exhibits characters, but this curious organ it is impossible to describe and make use of without figures.) It will, for the rest, be necessary to examine the animals much more scrupulously than has hitherto been done by most authors, for some described species are not recognizable, and at least *S. edwardsi*, Kr., is collective to such a degree, that between the limits adopted by W. Faxon it includes at least 4 species.

For the discrimination and description of the *Mastigopus*-forms, characters from all the structural features mentioned to be used in the adults can be derived, and moreover the armature of the abdominal segments and the shape of the telson frequently offer good characters. But it must be remembered that alterations in almost all parts take place during the development from the youngest to the oldest larval stage, some of the alterations being very great, others rather small. To succeed in the double aim—the reference of the *Mastigopus* to the adult *Sergestes* and the collocation of all the different stages of the same *Mastigopus*-species, distinguishing them from the stages of other species—we have but one way to go, which, in reality, is rather troublesome. (The development in aquaria of the various stages may be possible, but almost all species being tropical or subtropical, and besides belonging to the open sea, very little help from this method can be expected for many years.) The student must work with copious material, and having isolated and examined and determined all the specimens with black eyes, he must subdivide the species into groups, *making use of characters which alter very little during the older* Mastigopus-*stages and the development to the adult shape*; then he must search in the collection for the oldest *Mastigopus*-specimens which coincide with the adults in the characters mentioned, and try to refer them to the adults; at last he, being especially assisted by most of the same characters, must try to proceed backwards from the older to the younger and then to the youngest stages of every species, wherein he will in numerous instances be much assisted by the circumstance that different stages of the same *Mastigopus* are frequently taken together in the same haul. (Some authors not infrequently write in the descriptions of the small "species" that the specimens vary in several particulars, f. inst. in the development of the dorsal abdominal spines, and this is often derived from the fact that their degree of development has been somewhat unequal.) Applying this principle it will in many instances be possible to determine the youngest forms, which by Bate and Ortmann are

considered as the real *Mastigopus*, and even sometimes to determine the *Acanthosoma*, consequently to elucidate at least one-half of the total metamorphosis. As a rule the differences between the same older stage of any two species whatsoever are more conspicuous than the differences between the species of *Sergestes* to which they belong. During a long-continued study of a rich collection it will gradually be possible to arrive at complete certainty in the collocation of the series of stages of all species well represented, but in too numerous instances it is impossible to refer the forms to the representations of authors without examining their type-specimens.

The characters which undergo very little or almost no change during the metamorphosis from the older *Mastigopus* to the adult, and for that reason offer good marks for identification, are the following:—(1) the structure of mxp.^{3}, viz., whether they are scarcely longer than trl.^{3} with the 4 proximal joints of the same aspect (the fourth joint flattened) as in trl.^{3} and the two distal joints equally setaceous on both margins—or whether they are considerably or much longer than trl.^{3}, with the 4 proximal joints considerably thickened and much more robust than in trl.^{3}, and the 2 distal joints almost or totally naked along the one margin, while at least the sixth joint is armed with several long and a number of shorter spines on the other margin (but only the presence of spines, not their number, can here be taken into consideration; (2) the proportion between the naked and the hairy part of the external margin of ext. br. of urp.; (3) the relative length of the 3 joints (especially the first and the third) of the antenn. ped.; (4) the number of subjoints in the sixth joint of mxp.^{3}—Other characters of more secondary value will be pointed out in dealing with the species.

The character derived from the length of mxp.^{3}, and especially from the aspect of their 4 proximal joints in contradistinction to the legs and especially to trl.^{3}, *can also be used in every* Mastigopus-*stage*; it will even almost always be possible to refer a larva with mxp.^{3} broken off to one of the two groups by comparing the basal joint, which always persists, with the basal joints of the 3 following pairs of trunk-legs.—The character from the uropods is in most cases more or less subject to alteration during the development, and as a general rule it may be stated, that when only $\frac{1}{3}$–$\frac{1}{4}$ of the exterior margin is hairy in the adult, then this part approximates more and more towards occupying $\frac{1}{2}$ of the margin according to the youth of the specimens; but when the margin is hairy in the total or in c. $\frac{6}{7}$ of its length in the adult, then the hairy part is a little shorter in the younger, and still somewhat shorter in the youngest *Mastigopus*.—The character from the length of the joints in antenn. ped. also alters in the younger stages, with the result that the first joint is proportionally longer (and distally much narrower) in the younger than in the older *Mastigopus*-stages.—Several instances proving these rules will be found in the following descriptions of the species.

iv. *Synonymical and other Remarks.*

Before proceeding to a systematic arrangement, founded upon the characters mentioned, it will perhaps be convenient to undertake some reduction of the species, especially of the adult forms, with a view to freeing the next chapter, containing notes on the structure of the species and their larvæ, from these disturbing investigations.

The single species established by de Natale, *S. arachnipodus* (p. 19, Tav. ii. fig. 1), is quite unrecognizable to me, and will, in my opinion, never be interpreted with certainty; therefore I have omitted it from the systematic arrangement.

Of the 15 species described by Kröyer, only 4 (*S. frisii*, Kr., *S. arcticus*, Kr., *S. cornutus*, Kr., *S. edwardsi*, Kr.) have been established upon adult animals. Bate, Chun, and Ortmann have already considered *S. frisii*, Kr., to be identical with *S. atlanticus*, M.-Edw., but when Bate (*op. cit.*[1] p. 389) furthermore withdraws *S. arcticus*, Kr., this is, as pointed out by Ortmann, quite wrong. Of the remaining 11 species 8 are true *Sergestes*-larvæ, while the 3 others, viz. *S. obesus*, Kr., *S. caudatus*, Kr., and *S. serrulatus*, Kr., must be removed from the genus. *S. obesus*, Kr. (p. 257, tab. iv. fig. 10, *a–f*) is a very curious form; the single Kröyerian specimen had been dissected and most of the pieces are preserved, but an investigation of the type specimens of *S. sanguineus*, Chun (1889), proved that this form is identical and that both species have been established upon larvæ which differ so much from the *Mastigopus* of *Sergestes* that the species must be removed from this genus, and it will be discussed later on under *Petalidium*, Bate. *S. caudatus*, Kr. (p. 270, tab. v. fig. 14, *a–d*), is a very young *Penæus* that has just passed the *Mysis*-stage (Kröyer's representation of the trunk-legs is not correct, as his type specimen possesses a well-developed chela on trl.[1], behind which pair are found the basal joints of 4 pairs). *S. serrulatus*, Kr. (p. 268, tab. iv. fig. 12, *a–g*) is a very young *Acetes*, M.-Edw. Finally, *S. laciniatus*, Kr. (p. 274, tab. v. fig. 15, *a–e*), is, as already pointed out by Ortmann, identical with *S. corniculum*, Kr.

Of the species described by Stimpson only one is adult, viz. *S. pacificus*, Stimps. (p. 45), and it is, in my opinion, identical with *S. atlanticus*, M.-Edw., as the differences which the author states to exist between his species and Kröyer's description of *S. frisii*, Kr., are of no value. The fact is that the hepatic spine is placed a little more behind than in Kröyer's figure, in which also the trunk-legs are delineated a little shorter than they are in the animals. Of the other species, *S. longicaudatus*, Stimps., and *Sergia remipes*, Stimps. (p. 46), can, in my opinion, scarcely be recognized without examination of the type specimens.

Of *Serg. meyeri*, Metzger (p. 302, tab. vi. fig. 7), I have

[1] I always quote the 'Challenger' Report, not his preliminary paper; as to Kröyer, I refer to his monograph, omitting his earlier descriptions without figures.

examined the type specimen and must declare it to be a large female of *S. arcticus*, Kr. Sp. Bate has in all established 24 new species of *Sergestes*, of which but 3, *S. prehensilis*, Bate, *S. japonicus*, Bate, and *S. kröyeri*, Bate (all briefly characterized in 1881), are decidedly adults. Of the other species, *S. longicollus*, Bate (p. 421, pl. lxxvii. fig. 1), at least has almost arrived at the shape of the adult, but it is, as pointed out by Ortmann, synonymous with *S. tenuiremis*, Kr. It is impossible to me to form any idea of *S. profundus*, Bate (p. 428); Bate's specimens were very much mutilated. The other 19 species and *Sciacaris telsonis*, Bate (p. 438, pl. lxxviii. fig. 1), are all *Mastigopus*-forms in very different stages of development.—When Bate (p. 393, pl. lxviii.) describes and figures trl.[4] and trl.[5] in *S. atlanticus*, M.-Edw., as very short, this must, in my opinion, arise from an anomaly or from some other reason of no value, if the described and figured specimen really belongs to this species, for I am not convinced that all the specimens from the localities enumerated (p. 390) belong to *S. atlanticus*. He states that a specimen, 50 mm. in length, was taken "off Japan; depth 345 fathoms," and that 3 specimens, 43 mm. long, were trawled "south of Australia; depth 2150 fathoms." These 4 specimens at least must be re-examined, as among some hundred specimens I have not found one exceeding 30 mm., and the localities also make the determination somewhat doubtful. The specimens of *S. edwardsi*, Kr. (Bate, p. 403), must also be re-examined with the aid of my descriptions of hitherto not recognized allied species.

S. mollis, Smith, established by that author in 1884 (Rep. Comm. Fish and Fisheries, pt. x. p. 419), I consider to be identical with *S. japonicus*, Bate (described 1881), with which it agrees in the smallness of the eyes, the relative length and thickness of the joints in the antenn. ped., the shape of the squama, the soft and membranous integuments, and the number and the feeble development of the posterior branchiæ.

S. magnificus, Chun, established in 1888 (p. 33, Taf. iv. fig. 4 u. 5), is, according to my examination of one of the type specimens, identical with *S. arcticus*, Kr. Kröyer also has stated that the flagellum of the antennæ surpasses the total length of the animal about 3 times.—*S. sanguineus*, Chun, established in 1889 (p. 538, Taf. iii. fig. 1), is, as stated above, identical with *S. obesus*, Kr., and will be discussed later on under *Petalidium*.

In 1891 Wood-Mason (Ann. & Mag. Nat. Hist. 6th ser. vol. viii. p. 354) established *S. rubroguttatus*, W.-M., a species closely allied to *S. arcticus*, Kr., but the differences in the ext. br. of urp. pointed out by the author are certainly valid specific characters. For the rest, I believe that it may be possible to detect more characters. Perhaps the species is identical with *S. kröyeri*, Bate, established 1881, but both species being insufficiently described, I cannot settle the question, and therefore must support both species.

Of the species established by W. Faxon in 1893, *S. halia*, Fax.

(p. 217), must be mentioned; for in the final report, 1895, he withdraws it "as large and mature individuals of *S. edwardsii*," redescribing and figuring one of the three type specimens as this species (p. 212, pl. li. figs. 1–1*e*). But his representation shows that *S. halia*, Fax., must be maintained as valid, as the exterior margin of the ext. br. of urp. is naked in almost ⅓ of its length, while in *S. edwardsi*, Kr., it is hairy in the total length; furthermore, the rostrum, besides being somewhat differently shaped, is considerably shorter in the last-named species than in *S. halia*, Fax., a feature also observed by Faxon (p. 214). When he writes (p. 214):—"Kröyer notes a 'rare variety' of *S. edwardsi*, distinguished by a larger rostrum," I may remark that a preserved specimen of this variety belongs to another species, *S. penerinki*, Bate, H. J. H.

As to this last name and some other names in the following chapter I must say a few words. When an author in the same work has described an adult species and ..s *Mastigopus* as two species, the species, of course, retains the name of the adult. But in some instances only the *Mastigopus* has been described, while I also possess and briefly describe the black-eyed or even the mature form. In order to avoid new names I, in these cases, have used the name of the *Mastigopus* for the adult *Sergestes*, thinking that a double series of names, one for one of the not few *Mastigopus*-stages, and another for the adult species itself, cannot be maintained, as the *Mastigopus* and the *Sergestes*—in strong contradistinction to the relation between the *Squillidæ* and their larvæ—are connected with even transition. To avoid misapprehension I, in these cases, have placed my own name (H. J. H.) after the name of the author who has established the *Mastigopus*. It will, I fear, in the future also be necessary to adopt the oldest name for a species when its *Mastigopus* has been described before the adult.

v. *Conspectus of the Species.*

In the following tabular view (and added notes) all established species are enumerated, and besides two new species are named and later on described. The tabular view is worked out with reference to the adults and the *Mastigopus*-stages, with the exception of the youngest *Mastigopus*-stage (in several instances= *Mastigopus*, auct.), which sometimes differs very much from the somewhat older stages.

When the black-eyed form of a species has been described elsewhere or will be mentioned in my later notes, the name in the tabular view is printed with interspaced letters; if the really mature form is known I further mark the name with an asterisk. When the same stage, in most instances the adult one, has been described under various names, they are given as synonyms following the oldest name, but the different stages of a species are connected with a {.

By this, perhaps somewhat artificial, mode of proceeding it will, I hope, be easy to form a notion of the species.

Group I.

Mxp.[3] *at most but little longer, sometimes shorter than trl.*[3], its first joint rarely, *the second–fourth joints never obviously incrassated in proportion to the joints in trl.*[3], its two distal joints with numerous bristles along both margins. (In the *Mastigopus*, *S. longispinus*, Bate, the first joint is somewhat incrassated, the fifth joint with but few bristles, the sixth only with setæ along the one margin.)

A. On the ext. br. of urp. the ciliated part never occupies the half of the exterior margin.

a. The body very long and slender; the distance between the eye-stalks and the mandibles very long.

S. tenuiremis, Kr., H. J. H.
S. junceus, Bate.
S. longicollus, Bate.

b. The body shorter and less slender; the distance between the eye-stalks and the mandibles not very long.

a. The first joint in the antenn. ped. about as long as or shorter than the third.

S. atlanticus, M.-Edw. (*S. frisii*, Kr., *S. pacificus*, Stimps.).
S. ancylops, Kr.
S. ovatoculus, Bate.
S. cornutus, Kr.
S. longispinus, Bate.
S. inous, Faxon.[1]

β. The first joint in the antenn. ped. considerably or much longer than the third.

1. The second and third joints in the antenn. ped. stout.

S. robustus, Smith.
S. japonicus, Bate (*S. mollis*, Smith).
S. bisulcatus, Wood-Mas. (*S. phorcus*, Faxon, olim).

2. The second and especially the third joint in the antenn. ped. slender. (The *arcticus*-group.)

S. arcticus, Kr. (*S. meyeri*, Metzger, *S. magnificus*, Chun).
S. rinkii, Kr., vix Bate.
S. dissimilis, Bate.
S. mediterraneus, n. sp.
S. prehensilis, Bate.
S. kröyeri, Bate.
S. dorsospinalis, Bate.
S. laterodentatus, Bate.
S. nasidentatus, Bate.
(*S. rinkii*, Bate, vix Kr.)
S. læviventralis, Bate.
S. rubroguttatus, Wood-Mas.

[1] According to the description this species must belong to this subdivision, but it does not agree with the figure (*op. cit.* pl. li. fig. 2), which shows the first joint a little longer than the third.

B. On the ext. br. of urp. the ciliated part occupies more than the half of the exterior margin.

S. corniculum, Kr., H. J. H. (*S. laciniatus*, Kr.)
S. utrinquedens, Bate.
S. longirostris, Bate.

To this group further belong the following species: *S. præcollus*, Bate, *S. semiarmis*, Bate, *S. longicaudatus*, Stimps., *S. remipes* (Stimps.), and *S.* (*Sciacaris*) *telsonis*, Bate. All are but larvæ.

Group II.

Mxp.[3] *considerably or much longer than trl.*[3], *its 4 proximal joints considerably or* (*generally*) *very much incrassated or partially almost inflated in proportion to the joints in trl.*[3], its two distal joints with very short bristles or totally naked along the one margin, the sixth joint with a number of spines very different in length along the other margin, and a feebler armature may also be found on the fifth joint.

A. The adult and the older larvæ with two branchiæ above trl[3]., and the sixth joint of mxp.[3] divided into 5 subjoints. The adult with a comb of very numerous short spines along the one margin of the sixth joint and of the distal part of the fifth of mxp.[3] The larvæ with short eye-stalks.

S. henseni (Ortm.).
S. sargassi, Ortm.

B. The adult and the older larvæ with one branchia and a lamella above trl[3]., and the sixth joint of mxp.[3] divided into 4 or 6 subjoints. The adult without any comb on mxp.[3] The larvæ with moderately long or very long eye-stalks. (The *edwardsii*-group.)

a. On the ext. br. of urp. the exterior margin is ciliated in the whole length or (in the larvæ) at least in c. $\frac{11}{12}$ of the length.[1]

S. edwardsi, Kr.
S. oculatus, Kr.

b. On the ext. br. of urp. the exterior margin is ciliated at most in $\frac{7}{8}$ of the length.

α. The same exterior margin is in the larvæ ciliated at least in $\frac{3}{4}$, in the adults in more than $\frac{1}{2}$ of the length.

S. vigilax, Stimps., H. J. H.
S. parvidens, Bate.
S. penerinki, Bate, H. J. H.

β. The same exterior margin is ciliated in less than $\frac{3}{4}$ of the length.

S. incertus, n. sp.
S. halia, Faxon.
S. armatus, Kr.

[1] Here and in the following part of the tabular view I cannot include larvæ shorter than 9–10 mm. in length, as the character employed alters in the youngest stages (see later on).

To this group further belong **S. hamifer*, Alc. & And., which I am not able to recognize, and the following larvæ: *S. intermedius*, Bate, *S. diapontius*, Bate, *S. fermerinkii*, Bate, *S. spiniventralis*, Bate, and *S. ventridentatus*, Bate, several of which certainly belong to some of the species in the tabular view, but I cannot recognize them; *S. macrophthalmus*, Stimps., in all probability being a younger *S. vigilax*, Stimps.; finally *S. brachyorrhos*, Kr., which is a very young larva of *S. edwardsii*, Kr. (see later on).

S. arachnipodus, de Nat., and *S. profundus*, Bate, I have not been able to refer to any one of the groups; to *Petalidium* is transferred *S. obesus*, Kr. (*S. sanguineus*, Chun), and excluded as not belonging to the genus are *S. serrulatus*, Kr., and *S. caudatus*, Kr.

vi. *Notes on the Species of Group* I.

A. *a. S. tenuiremis*, Kr. The specimen described by Kröyer (p. 255, tab. iv. fig. 11, *a–b*) is a hardly half-grown *Mastigopus*; *S. longicollus*, Bate (p. 421, pl. lxxvii. fig. 1), is almost (or perhaps fully) adult; *S. junceus*, Bate (p. 416, pl. lxxvi. fig. 1), is the young *Mastigopus*, 6 mm. long, with dorsal spines on the 4th–6th abdominal segments. I have examined a specimen 23 mm. in length, which had just obtained the black eyes; the species grows at least somewhat longer before maturity, but the mature form is unknown. The obtaining of black eyes does not always take place at the same length of the animal, as a specimen with the larger, oblique, yellowish eyes is even 26 mm. long. The species is easily separated from all other known forms by the combination of two characters: the very long and slender body with the long distance between the eye-stalks and the mouth-organs, and the ciliated parts on the ext. br. of urp. occupying, in the older forms scarcely $\frac{1}{3}$, in the younger a little more than $\frac{1}{3}$ of the exterior margin. The quoted figure of *S. longicollus*, Bate (pl. lxxvii.), gives a tolerably correct notion of the species.

It may further be added that of the two branchiæ above trl.^{3} the first is long and the second a little more than half the length of the first and but a little shorter than the first branchia to trl.^{4}, while the second above trl.^{4} is somewhat smaller, but still very well developed. I have seen specimens of this species from numerous localities in the Atlantic, northward to lat. 32° 16′ N., in the Indian Ocean, and in the Pacific as far as the Matelota Islands and lat. 16° 8′ S., long. 111° 50′ E.

A. *b. a. S. atlanticus*, M.-Edw. As to the synonymy etc., see above. The best representation of this very common species is given by Kröyer (*S. frisii*, Kr., p. 235, tab. i. fig. 1, *a–v*). The sixth joint of mxp.^{3} consists of 6 subjoints, the 4 distal of equal length and each of the 2 proximal as long as 2 of the distal subjoints together. The branchial formula as in *S. japonicus*, Bate (*S. mollis*, Smith), viz. a podobranchia and a lamella to mxp.^{2}, a pleurobranchia and a lamella to mxp.^{3} and trl.^{1}-trl.^{3}, finally 2 pleurobranchiæ to trl.^{4}, but the branchiæ are longer than in *S. mollis*, Smith (Rep. Comm. Fish and Fisheries f. 1885, pl. xx. fig. 5), and

the 2 branchiæ above trl.[4] are well developed; the statements of earlier authors on the branchiæ of this species are rather deficient.

As stated above, *S. ancylops*, Kr. (p. 262, tab. iii. fig. 8,*a–e*), is the *Mastigopus* of *S. atlanticus*, and I have seen every stage of transition between the larva and the adult. *S. ovatoculus*, Bate (p. 408, pl. lxxiv. fig. 2), is a stage a little older than that described as *S. ancylops* by Kröyer and Bate.

The stages from 7 mm. in length and more are easily distinguished from all other known larvæ by the shape of the eyes, of which Kröyer has given two good figures, and also in the still younger stages mentioned below the eyes have a rather similar shape; in the older stages the sixth joint of mxp.[3] shows the same subdivision into 6 joints as is found in the adult.

A small specimen examined by me is scarcely 6·5 mm. long, trl.[4] is even shorter than the two proximal joints of trl.[3] together; the eyes and the eye-stalks are longer than in the stage figured by Kröyer, reaching a little beyond the basis of the third joint of the antenn. ped.; the first joint of this peduncle is about $\frac{1}{10}$ longer than the third; the very long and slender rostrum occupies $\frac{2}{3}$ of the length of the eye-stalks and carries a small dorsal spine over its basis; the inferior side of the abdominal segments is without spines, while a rudiment of a spine is present on the dorsal side of the third segment, and the spines on the fourth and fifth segments are a little longer than in the following stage; the ciliated part of the ext. br. of urp. occupies a little more than $\frac{3}{5}$, but not $\frac{1}{2}$ of the exterior margin.

The smallest specimen examined by me is but 3·5 mm. long, without the rostrum; the eye-stalks are extremely long, together with the eyes almost as long as the carapace in the median line; the rostrum reaches almost to the tip of the eyes and is adorned with a shorter dorsal spine at the basis and with some short setæ on the distal part; the supra-orbital and the hepatic spines are considerably elongated. The dorsal spine on the third abdominal segment is rather long, the spines on the fourth and fifth segments very long; the epimera of the 5 anterior segments are each produced into a fine spine bent somewhat outwards; the spine on the ext. br. of urp. is placed almost before the middle of the exterior margin, and the branch itself is extremely slender, 13 or 14 times longer than broad. This stage, thus rather diverging from the older ones, is, in my opinion, the youngest *Mastigopus*, and was taken by Prof. Chun at the Canary Islands.

Of *S. atlanticus* I have seen specimens from the Atlantic, northward to lat. 42° N., from the Indian Ocean and from the Pacific lat. 15° S., long. 109° 20′ E., and the China Sea.

S. cornutus, Kr. (p. 249, tab. ii. fig. 2, *a–l*). This species is easily distinguished from *S. atlanticus*, M.-Edw., by the following characters:—The rostrum is much longer, directed obliquely forwards and slenderly acuminated, the eyes are smaller, the third joint of the antenn. ped. is distinctly longer than the first,

which, from the spina on the outer margin, is strongly tapering towards the apex, the outer margin even being slightly concave in outline; the sixth joint of mxp.^{3} is distinctly 4-jointed, the relative length of these subjoints as in the larva (see below). Above trl.^{3} a well-developed pleurobranchia and a lamella, above trl.^{4} a well-developed pleurobranchia and a lamella with 2–5 branches at the tip, thus a branchia very little developed and more feeble than in any other adult species known to me.

S. longispinus, Bate (p. 417, pl. lxxvi. fig. 2), is most decidedly the larva of *S. cornutus*, Kr. It attains a length astonishing as compared with that of the adult. The specimen which I am about to describe is 13 mm. long, while the adult male is but 16 mm. The rostrum is somewhat longer than in the adult, without dorsal spine, the supra-ocular and the hepatic spines and the gastro-hepatic groove are well developed. The eye-stalks are very long, the large, somewhat oblique eyes lie above the basis of the third joint of the antenn. ped., the relative length of which is almost as in the adult. Mxp.^{3} is but little longer than trl.^{3} and constitutes in several respects a transition-form to *S. edwardsi*, Kr., and allied species; the first joint is considerably incrassated, second–fourth joints but little coarser than in trl.^{3}, the fourth joint with very few and short bristles, the fifth with few setæ more developed on the one than on the other margin, the sixth joint as long as the fifth (a character also found in *S. atlanticus*, etc., while in the *edwardsi*-group the fifth joint is much longer than the sixth), divided into 4 subjoints, of which the first is $\frac{3}{2}$ times longer than the second, and this is as long as the last 2 subjoints together, which are about equal in length, or the third somewhat longer than the fourth; the 3 proximal subjoints each with very few short setæ, and at the end with 2 very long stiff setæ or slender spines, the fourth subjoint with one short and 3 very long apical spines, which, however, are scarcely more robust than those on trl.^{3} or trl.^{3}, trl.^{4} reaching a little beyond $\frac{2}{3}$ of the fourth joint of trl.^{3} Above trl.^{4} a well-developed branchia and a lamella with 3 short apical branches. The 3 anterior abdominal segments each with a rather short dorsal spine, which, at least on the 2 anterior segments, is directed obliquely forward, the fourth segment without any spine and the fifth and sixth each with a short spine; the 4 anterior segments having on the middle of each epimeron a spine directed outwards, the spine being short on the three segments and somewhat longer on the fourth, the fifth segment with a very long spine directed downwards and bending somewhat forwards, and issuing from the inferior margin at a short distance from its posterior end; the sixth segment with a small spine turned downwards from the posterior edge. As in the mature form, the ciliated part occupies between $\frac{1}{3}$ and $\frac{1}{4}$ of the exterior margin of the ext. br. of urp.

The specimen described differs considerably from the figure given by Bate, but the form described by him is somewhat younger. My determination is decidedly correct, as two similar

specimens, the one determined by Chun, the other by Ortmann, are referred by these authors to the same species.

S. cornutus, Kr., and especially *S. longispinus*, Bate, present some affinity to *S. edwardsi*, Kr., and allied species, which becomes very evident by the fact that a short process is found on the outer side of the third joint of trl.[1] and trl.[2]

Of *S. inous*, Fax., I have seen no specimens.

A. *b*. β. 1. Of *S. robustus*, Smith, *S. japonicus*, Bate (*S. mollis*, Smith), and *S. bisulcatus*, Wood-Mas., I have seen no specimens. Of *S. robustus* we possess several stages of the *Mastigopus*, but having found none of them described I will omit discussing them in this paper.

A. *b*. β. 2. This rich section of adults and larvæ I have called the *arcticus*-group, as they are very nearly related to each other, and *S. arcticus*, Kr., is the only one well described of the mature forms and the sole species of which I am able to trace the whole development from the *Acanthosoma* (incl.) to the adult. I will begin with some remarks on the adults and on a subadult species.

S. arcticus, Kr., is well represented by Kröyer (p. 240, tab. iii. fig. 7, *a–g*; tab. v. fig. 16); later on S. I. Smith, in the various papers (see above), communicates some additional notes and good figures. The species has been captured in the Atlantic, northward to Greenland, and southward to lat. 38° S., long. 12° E. (Mus. Copenh.); further, in the Mediterranean near Ischia (*S. magnificus*, Chun), and some older larvæ in the Adriatic at Ragusa and Lesina (Chun's collection). But, together with these last larvæ, I found in Chun's collection some young specimens and older larvæ of a new and unfortunately closely related species, *S. mediterraneus*, n. sp., which makes it necessary to present some remarks on the two species, so that it will be possible to distinguish them from each other. Previously no valid species allied to *S. arcticus*, Kr., was known from the Atlantic or the Mediterranean.

The largest specimen of *S. mediterraneus*, m., is 19·5 mm. long, and has almost assumed the adult shape, but the eyes are still not black and therefore their final magnitude cannot be determined. Of characters between this subadult stage and the subadult and adult *S. arcticus*, Kr., I have found the following:—*S. mediterraneus* is destitute of the hepatic spines and the gastro-hepatic groove; the supra-ocular spines are quite rudimentary; the basal joint of the antenn. peduncle is obviously somewhat shorter than the two following taken together, which are a little more coarse than in *S. arcticus*, while the basal joint from the spine near the basis of the exterior margin is somewhat more narrow, with the exterior margin less convex in outline than in *S. arcticus*; the ext. br. of urp. is but 4 times longer than broad, with the outer margin beyond the spine strikingly concave. In *S. arcticus*, Kr., the supra-ocular and hepatic spines and the gastro-hepatic groove are well developed; the basal joint of the antenn. ped. is (measured with accuracy) almost or quite as long as the two following taken together; the ext. br. of urp. is exactly 5 times longer than

broad—thus conspicuously more narrow than in *S. mediterraneus*, m.; and the outer margin beyond the spine but slightly concave. The branchiæ (comp. the notes of S. I. Smith in Bull. Mus. Comp. Zool. vol. x. p. 96) do not seem to present any character fit for use. *S. arcticus*, Kr., is smaller than the other species when the eyes obtain the black colour.

Above I have mentioned that *S. rubroguttatus*, Wood-Mas., from the Indian Ocean is, in my opinion, a valid species, as the exter. br. of urp. is described and figured (Ann. & Mag. Nat. Hist. ser. 6, vol. viii. p. 354) to be much more narrow than in *S. arcticus*, Kr., and without the spine on the outer margin. *S. kröyeri*, Bate, and *S. prehensilis*, Bate, are unknown to me; they have the same branchial formula as *S. arcticus*, but a new investigation of both species is much needed; perhaps *S. rubroguttatus*, Wood-Mas., is synonymous with *S. kröyeri*, Bate.

Of *S. arcticus*, Kr., our museum possesses a series of all stages from the *Acanthosoma* (incl.) to the mature form. One of these stages is *S. rinkii*, Kr. Kröyer's representation (p. 265, tab. ii. fig. 3, *a–g*) corresponds well with specimens of 8 mm. in length, rostrum not included, and is rather good; thus he describes and figures the eyes with their long stalks, the very characteristic antenn. ped., the shape of the squama, the dorsal spines on the abdomen, the long pleopods, the uropods with their exterior branch being very characteristic for the young *Mastigopus*, viz. 6·5 times longer than broad and the ciliated part of the exterior margin considerably longer than in the adult, finally the telson, which has a shape very different from that found in the adult—but the representation of the carapace is deficient (see later on) and misleading in one particular. Thus he describes the rostrum as being short, but it must already then have been broken off in one or two of his specimens; in reality it is about as long as the eye-stalks (without the eyes), and adorned at the basis with a dorsal spine almost as long as the diameter of the eye.

The largest specimen of *Acanthosoma*, which, however, I shall not try to describe, is, the rostrum not included, 5·3 mm. in length, and with the rostrum (which reaches somewhat in advance of the eyes) c. 6·6 mm. long. Among the type specimens of Kröyer I find two specimens, which must be the stage immediately succeeding the *Acanthosoma*; one specimen is with the rostrum 6·9 mm. long, but from another locality I have seen a specimen in the same stage measuring even 8 mm. This stage differs considerably from that described by Kröyer, and therefore a short account of it shall be given. The rostrum is exceedingly long, reaching a little in advance of the eyes, on the distal part adorned with some short and fine setæ, and at the basis originates a setaceous dorsal spine, which is adorned with some short and fine setæ and is longer than the diameter of an eye. The supraocular spine is well developed, and the hepatic spine exceedingly long, considerably longer than the diameter of an eye; just in front of the gastro-hepatic groove is observed a short protuberance in the median line. The eyes

reach to the middle of the second joint of the antenn. ped.; the basal joint of this peduncle is to the two following together as 11 to 8; trl.[4] and trl.[5] are only buds. The first and second abdominal segments each with a short dorsal spine, the third to sixth segments each with a long spine; the first segment a little above the middle of each side with a rather short spine directed outwards, and besides the epimera of the five anterior segments each produced into a rather long spine, which is directed outwards and on the two anterior segments even bent somewhat upwards and forwards; the sixth segment below on the posterior edge with a shorter spine. The ext. br. of urp. is about 8 times longer than broad, and the spine a little beyond the middle of its exterior margin. Telson with a long process from each of its posterior edges.

The following stage is that described by Kröyer: the rostrum is as already mentioned, the hepatic spine has become somewhat shorter than in the preceding stage; on the abdomen the dorsal spines are somewhat reduced and the epimeral spines are lost, but the spine on the side of the first segment is still visible.

During the subsequent stages a series of alterations take place. The rostrum becomes shortened, but is, however, still during a longer period more than half as long as the eye-stalks, its dorsal spine and the hepatic spines are considerably shortened, the eye-stalks become somewhat shorter; the median protuberance is preserved during some time; the abdominal spines soon completely disappear. In the antenn. ped. the two distal joints together successively are approaching the length of the basal joint, which from being distally slender with the lateral margins slightly converging obtains a considerable breadth with the external margin somewhat convex in outline. The ext. br. of urp. becomes proportionally broader and the spine more remote from the middle of the exterior margin; the process from the edge of the telson becomes shorter and finally disappears. One of these stages is *S. dissimilis*, Bate, described by Bate (p. 437), and later on described and figured by Ortmann (p. 35, Taf. iii. fig. 2).

The sub-adult stage of *S. mediterraneus*, m., is shortly described above. The smallest larva of this species known to me is about 9·5 mm. long, and this and a specimen a little longer are easily distinguished from the similar stage of *S. arcticus*, Kr. The eye-stalks are somewhat shorter; the rostrum is rather short, not half the length or about one-third of the length of the eye-stalks, with a trace of a spine on its superior margin, the hepatic spine is rudimentary or wanting; in the antenn. ped. the two distal joints together are shorter than the basal one, and this presents a shape other than in *S. arcticus*, as in its distal half the lateral margins are parallel with each other; and this part is scarcely broader than the two distal joints, which are obviously coarser than in *S. arcticus*; a very short dorsal spine is present on the fourth to sixth abdominal segments; the ext. br. of urp. is proportionally broader than in *S. arcticus*, between 4 and 5, but not 5 times longer than broad.

As stated above, *S. arcticus*, Kr., has not been captured outside

the Atlantic (incl. the Mediterranean and the Arctic sea at Greenland). This is of importance for the reference of larval stages, as Bate has established the species:—*S. dorsospinalis*, Bate (p. 394, pl. lxxii. fig. 1) and *S. laterodentatus*, Bate (p. 395), captured "associated with" another "South of Australia"; *S. nasidentatus*, Bate (p. 398, pl. lxxii. fig. 2), "between Valparaiso and Juan Fernandez"; *S. rinkii*, Bate, vix Kröyer (p. 404, pl. lxxiii. fig. 3), "New Hebrides" and "South Pacific"; and *S. læviventralis*, Bate (p. 425, pl. lxvii. fig. 3), "North of New Guinea"—which 5 reputed species are all larvæ and all belong to two or three species closely related to *S. arcticus*, Kr., or perhaps partially belong to that species. But Bate's representations are not sufficiently good for the decision of such questions: thus, f. inst., the chances are that he has overlooked the hepatic spine in some of the "species," while *S. laterodentatus*, Bate, has obviously been established on a specimen with a long hepatic spine, which has given rise to the name. His description of *S. rinkii* either involves the fault that the rostrum, which is described and figured as short, has been broken off, or the form must decidedly be different from *S. rinkii*, Kr., as a short rostrum and dorsal abdominal spines are not coexistent in this latter species.—In all probability Bate's 5 species belong to two or three of the other known species of the *arcticus*-group, and none of them to *S. arcticus*, Kr., itself.

Further elucidation of the adults and the larvæ of the *arcticus*-group I am not able to derive from existing literature. Yet the result has been that 2 adult and 2 larval species have been cancelled as belonging to *S. arcticus*, Kr., and the other related forms; 3 adult species and 4–5 larvæ have been collocated into the group; finally one new species has been established.

B. *S. corniculum*, Kr.—The stage described and figured by Kröyer (p. 252, tab. iii. fig. 4, *a–e*) and Bate (p. 410, pl. lxxv. fig. 1) is a half-grown larva. The mature form is unknown. The adult with black eyes, 20–22 mm. long, is rather remarkable, as the body is extraordinarily slender, with a considerable distance between the mouth and the eyes, thus in that respect approaching to *S. tenuiremis*, Kr., and being intermediate between this species and f. inst. *S. arcticus*, Kr. Its rostrum is a little lower than in *S. arcticus*, Kr., the supraocular spine rudimentary or lacking, the hepatic spine short, the gastro-hepatic groove distinct. The eyes are but a little broader than the end of the stalk; in the long antenn. ped. the first joint is considerably longer than the third and this considerably longer than the second. An interesting character is that the sixth joint of mxp.^{3} is divided into 4 sub-joints, the distal three of equal length and the first somewhat longer, and each of these 4 joints is more or less distinctly divided into 2 joints: thus we obtain 8 sub-joints, of which 7 possess a long seta or slender spine on each side near the apex, but the two spines are not placed opposite to each other, and the last sub-joint has a pair of slender apical spines. The branchiæ recall those in *S. arcticus*, Kr.: above trl.^{3} two branchiæ, the first long, the second several

times shorter and very narrow; the first branchia above trl.^{4} is but half as large as the corresponding one above trl.^{3}, the second half as large as the first but a little larger than the second above trl.^{3}. (In somewhat younger specimens with yellowish eyes all 4 branchiæ are very distinct; the animals are, for the rest, relatively shorter and stouter.) The ext. br. of urp. without any spine on the exterior margin, of which the ciliated part occupies from a little more than the half to about three-fifths of the length.

As to the half-grown larvæ, the representations of Kröyer and Bate will be sufficient.—A younger larva, 6·4 mm. long, coincides fairly well with *S. utrinquedens*, Bate (p. 433), in most respects, but yet differs in several particulars from Bate's description. The supraocular and hepatic spines are well developed; the rostrum is almost as long as the eye-stalks (the eyes not included), with a short and fine dorsal spine at the base; the eyes are much larger and the eye-stalks longer than in the stage described by Kröyer and Bate. The third joint of the antenn. ped. is but a little longer than the second, and the first one as long as the two others taken together. The fourth to sixth abdominal segments each with a very short and fine dorsal spine, the epimera of the first to fourth segments each produced into a short spine, while this spine is considerably longer on the epimera of the fifth segment; the first segment besides on the side having a spine arising from the anterior margin and directed forwards and outwards. On the ext. br. of urp., which is almost seven times longer than broad, the ciliated part occupies a little more than the half of the exterior margin, which—as in almost all young larvæ—is furnished with a well-developed spine.

Of *S. corniculum*, Kr., I have seen numerous specimens from the Atlantic northward to lat. 42° N., from the Indian Ocean and ranging into the Pacific to the Matelota Island and to lat. 16° 10′ N., long. 132° E.

Whether the above-quoted *S. utrinquedens*, Bate, may be a young larva of *S. corniculum*, Kr., or of another species I am not able to decide.

S. longirostris, Bate (p. 415, pl. lxxv. fig. 3).—Prof. C. Chun has determined the small stage of *S. corniculum*, Kr., just described as *S. longirostris*, Bate, which is stated to be 6 mm. long and captured in "Mid Atlantic," and it is very possible that this determination may be correct; but Bate's figure represents the eye-stalks and the rostrum a little too long, and especially a different proportion between the joints of the antenn. ped. &c. I believe that it is impossible to decide whether this identification is correct.

Above I have further enumerated 5 species belonging to Group I. Of these species *S. præcollus*, Bate (p. 423, pl. lxxvii. fig. 2), is at least rather nearly related to *S. corniculum*, Kr., from which it seems to differ by a somewhat different shape of the ext. br. of urp. and by having the fifth abdominal segment "dorsally produced to a point." *S. longicaudatus*, Stimps. (p. 46), is a larva perhaps belonging to the *arcticus*-group. On the three other species, all larvæ, I have no opinion.

vii. *Notes on the Species in Group II.*

A. *S. henseni* (Ortm.).—Of this interesting species I have seen only two adult specimens, lent me by Geheimrath Prof. Dr. V. Hensen. As the representation by Ortmann (p. 38, Taf. iii. fig. 3) is rather deficient, I shall add some notes. The rostrum is low and short; the supraorbital and hepatic spines are short. Mxp.^{3} is considerably longer than trl.^{3} and its 4 proximal joints, though more slender than in the following species, are yet much stouter than in trl.^{3}; the 2 distal joints are quite naked along one margin, the fifth almost more than double as long as the sixth, which is divided into 5 subjoints, the last 4 of which are equal in length, while the first of them is as long as the two following together; at the base of the first subjoint and at the apex of the first, third, and fifth subjoints is found a long spine; at the apex of the second, fourth, and fifth subjoints a spine about half as long as the long spines; finally along the same margin a fine comb of very numerous spines about as long as the diameter of the joints; the fifth joint of mxp.^{3} has about 10 longer spines along the margin and on its distal two-fifths a comb similar to that on the sixth joint, but its spines become shorter towards the base. By this singular armature the species is easily distinguished from all other species known to me. Above trl.^{3} a large and a very small branchia, the latter of which is less than a third as long and but half as broad as the large branchia; above trl.^{4} two branchiæ, the anterior somewhat larger, the posterior somewhat smaller than the small branchia above trl.^{3}; thus the branchiæ are very different from those in the other species of the group. In the following species we find a well-developed process on the third joint of trl.^{1} and a similar one on trl.^{2}, but in this species the process in trl.^{1} is rudimentary and wanting in trl.^{2} On the ext. br. of urp. no spine is found on the exterior margin, and in the one specimen the ciliated part occupies three-fifths, in the other specimen almost four-fifths of its length. In no other species have I met with any similar variation in this feature, but it also exists in the larvæ (see below).

S. sargassi, Ortmann (p. 34, Taf. iii. fig. 1), is the *Mastigopus* of *S. henseni*. As the material seen by me is rather incomplete, the larger specimens being not very large and besides defective, I add only a few remarks to Ortmann's description. Mxp.^{3} is elongated and incrassated in proportion to the legs as in the adult, the fourth joint at the apex and just above the articulation produced into a large, conical process—a very good character for the species; and in a larva a little more than half-grown the sixth joint was already divided into the 5 subjoints. In the largest well-preserved specimen, 8 mm. long, I found above trl.^{3} a large branchia and a lamella, comparatively somewhat larger than usual, which had begun to develop itself into a very small branchia, above trl.^{4} a very small branchia and a simple lamella; the normal lamellæ above trl.^{1} and trl.^{2} are a little larger than usual. As in the adult the ciliated part on the exterior margin of the ext. br. of urp. occupies about three-fifths or four-fifths of its length in specimens between 4·5 mm. and

9·6 mm. in length, and the spine is wanting or very small, rarely of moderate size.

In a specimen 6·2 mm. in length the abdomen has lost its spines, the branchial lamellæ to mxp.^{3} and to trl.^{1}–trl.^{3} are very large in proportion to the branchia, still being small, and above trl.^{4} no branchia or lamella is developed. In the older stages the eye-stalks are short and the eyes are very large, but in the younger stages—between 4·5 mm. and 6·5 mm. in length—the eyes are still considerably larger; and in specimens of 4·5–5 mm. in length the rostrum is present as a fine and shorter or longer spine; and there are short or very short spines on the fourth to sixth abdominal segments. Such a larva, 5 mm. long, is briefly mentioned and figured by Bate (p. 428, pl. lxv. fig. 4) as *Mastigopus tenuis*, Bate; the figure shows the characteristic process on the fourth joint of mxp.^{3}, the rostrum is not delineated slender enough. The smallest specimen seen by me is, rostrum not included, c. 2·5 mm. long; the rostrum is as long as the carapace in the median line and distally furnished with fine spines; the eyes are of enormous size and the eye-stalks shorter than in the older stages; the third abdominal segment has a short dorsal spine, the fourth and fifth segments each a very long, the sixth segment a long dorsal spine.

B. For the following species, all belonging to the *edwardsi*-group, I think it convenient to give some introductory remarks, and next to treat the adult animals and the *Mastigopus*-forms separately.

Of adult animals there have been described only *S. edwardsi*, Kr., and *S. hamifer*, Alc. & And., to which *S. halia*, Fax., established in 1893, and in 1895 unjustly withdrawn by the same author, must be added. But in our museum I have found 4 species of adult forms and 5 species of larvæ, 4 of which most decidedly belong to the 4 adult forms; thus an adult form unknown to me must exist. One of the adult species is *S. edwardsi*, Kr., but I have not been able to refer any of the three other species to *S. halia*, Fax., or *S. hamifer*, Alc. & And.; the reasons will be given later on.

How safely I have been able—though not without a rather protracted investigation—to refer the larvæ to the adults will appear from the following case. The old larvæ are very easy to separate, and I possessed 5 species but only 3 of the adults. By the examination of the characters of the larvæ I was induced to re-examine one of the adult species and then it became apparent that it was composed of 2 very closely allied but valid species. Undoubtedly authors have commingled 2–3–4 species in references to *S. edwardsi*, Kr., and between the limits adopted by Faxon it, as stated above, includes at least 4 species.

The adult species are all closely related and very similar to each other. They are all characterized by the above-mentioned powerful development of mxp.^{5}, which is much longer than any of the trunk-legs; the 4 proximal joints are much incrassated and especially the thickening of the fourth joint is most conspicuous; the sixth joint is much shorter than the fifth, both strongly compressed and on

the one margin furnished with extremely short spines or almost naked, while the other margin of the sixth joint and at least of the distal half of the fifth joint is armed with rather numerous spines, some of which are very long and rather robust. The differences in the armature, especially of the sixth joint, yield very good characters for the species. (The distal part of the fifth joint is most frequently cut off by a secondary articulation.) The eyes are middle-sized, the supraocular and hepatic spines well developed. In the antenn. ped. the first joint is very little longer to somewhat shorter than the third joint, which is slender and obviously longer than the second. On the third joint of trl.[1] and trl.[2] the processes represented by Kröyer in *S. edwardsi* (tab. iv. fig. 9 *f* and 9 *g*) are well developed. The branchial formula as in *S. atlanticus*, M.-Edw. (see above); the branchiæ above the trunk-legs are very long, above trl.[3] one branchia and a lamella; trl.[4] 2 branchiæ, the first of which is about as long as the preceding, the second somewhat shorter and only half as broad, but yet very well developed. The exterior margin of the ext. br. of urp. without any spine or tooth at the proximal end of the ciliated part.

S. edwardsi, Kr.—Kröyer in his representation (p. 246, tab. iv. fig. 9, *a–k*) mentions a variety with longer rostrum, but this belongs to another species, viz. *S. penerinki*, Bate, H. J. H. The species is easily distinguished from all the other species by the character given in my tabular view: that the ext br. of urp. has the exterior margin ciliated along its whole length—and besides by the following features in the structure of mxp.[3] *The sixth joint of this pair is divided into 4 subjoints about equal in length, and each of the 2 distal subjoints is rather or very distinctly divided into 2 subjoints*, thus in all 6 subjoints; the joint *ends with 2 spines* of equal or different length, but at least the one is very long; next its interior margin is furnished with 35–38 spines of very different lengths (and the apical spine on the first, second, and fourth of the 6 subjoints is exceedingly long); besides *a very long spine is present on the same three subjoints on the one side near the exterior margin.* The fifth joint of mxp.[3] also presents some characters, which, however, are omitted. The rostrum is shorter than in the other species of the group, laterally compressed, and seen from the side more or less plainly forming an oblique triangle.—Length 14–21·5 mm.

I have seen specimens from the Atlantic northward to lat. 20° N. (the larvæ to lat. 23° 31′ N.), from the Indian Ocean, and passing towards the Pacific to Djilolo Isl. (c. lat. 1° N., long. 127° 5′ E.).

The three, or perhaps four, next species are easily separated from *S. edwardsi*, Kr., by several characters. *On the ext. br. of urp. at least c. ⅓ of the exterior margin is naked. In mxp.[3] the sixth joint is divided into but 4 subjoints very unequal in length*, the third being but half as long as the second; the *joint ends with but* one *spine*, which is very long, and the interior margin of the joint is armed with but 15–25 spines, and no spine exists on the side of any of the subjoints near the exterior margin.

S. vigilax, Stimps., H. J. H.—Only the *Mastigopus* has been described (see later on). The adults of this and the next species, *S. penerinki*, Bate, H. J. H., are very closely related to each other and easily separated from *S. incertus*, n. sp., and *S. halia*, Fax., by the character, that on the ext. br. of urp. the ciliated part occupies between $\frac{4}{5}$ and $\frac{7}{8}$ of the exterior margin. The best character between *S. vigilax* and *S. penerinki* is that in *S. vigilax* the interior margin of the sixth joint of mxp.^{3} is armed with 22–25 spines, of which 4 are implanted on the third subjoint, which is but a little or scarcely shorter than the fourth; in *S. penerinki* the sixth joint is armed with c. 15 spines (the apical one as usual not included), of which but two on the third subjoint, which is considerably shorter than the fourth. In *S. vigilax* the rostrum is of medium length, strongly laterally compressed, seen from the side rather broad and apically more or less distinctly truncated, with an acute prolongation from the superior edge.—Length 16–27 mm.

This species is as common as *S. edwardsi*, Kr.; I have seen numerous specimens of adults and larvæ from the Atlantic northward to lat. 42° N.; in the Indian Ocean the larvæ are common and distributed eastward to lat. 24° 50′ S., long. 103° E.

S. penerinki, Bate, H. J. H.—Only the *Mastigopus* has been described (see below). The rostrum of the adult is somewhat elongated, seen from the side a little more narrow than in *S. vigilax* and from the middle tapering towards the acute apex. The chief character in the structure of mxp.^{3} is given under *S. vigilax*.—Length c. 18·5 mm.

I have seen but two adult specimens, the one captured at lat. 17° N., long. 22° W., and this is one of the specimens alluded to by Kröyer as a variety of *S. edwardsi*.

S. incertus, n. sp.—Only one adult specimen, a female, has been seen, but this is a giant in comparison with the other related species, being 47 mm. long. On the ext. br. of urp. the ciliated part occupies between $\frac{1}{3}$ and $\frac{1}{4}$ of the exterior margin. The first joint of the antenn. ped. is scarcely shorter than the third. The rostrum is somewhat elongated, strongly compressed; seen from the side the proximal half is rather broad and then it tapers towards the acute apex. The interior margin of the sixth joint of mxp.^{3} with but 13 spines, two of them on the third and one on the fourth subjoint, which is but very little longer than the third. The other characters are mentioned above.

The adult specimen was captured (on the surface) in lat. 34° 50′ S., long. 4° 30′ W.; a sub-adult specimen near that locality, and a larva in lat. 40° 4′ S., long. 53° 20′ E.

S. halia, Fax.—The specimens on which this species was established in 1893 are just the large specimens described and figured by Faxon in 1895 as a variety of *S. edwardsi*, Kr. (p. 212, pl. li. figs. 1–1*e*). This species, of which I have seen no specimen, is closely related to *S. incertus*, m., but disagrees in one character, about which Faxon writes, p. 213: "The first and second segments of the antennule are of about equal length, while the

third segment is longer than the first or the second by one-half." Unfortunately Faxon does not describe or figure the sixth joint of mxp.[3] I think that the species will prove to be different from *S. incertus*, m. When Faxon states that 6 large pleurobranchiæ and one smaller podobranchia are present on each side on the body, he certainly has overlooked the 5 lamellæ, which I have found in *S. incertus* and the other species of the *edwardsi*-group.

S. hamifer, Alc. & And., I will mention here, though I have not been able to insert it in my tabular view. The description (1894) and the figure (1895) plainly show that it belongs to this group. As in mxp.[3] "the propus is four-jointed," the species cannot be identical with *S. edwardsi*, Kr., but it is impossible for me to settle whether it be really valid or synonymous with one of the other species. Only two characters I have been able to detect, viz.: that mxp.[3] seems to be still longer than in any other species, and that its fifth joint is curiously arcuated (see the figure); but it is difficult to say whether these two characters are valid, for instance, to decide whether the shape of the mentioned fifth joint may not be due to some artificial cause. The species must be re-examined.

As mentioned above, I have examined five older *Mastigopus*-forms, four of which have been elsewhere described. The older specimens, c. 10–15 mm. in length, are easily recognized from each other, and some few characters shall be pointed out; but the younger stages are more difficult, being more spiny, &c., and besides the materials seen by me are rather insufficient, and the animals difficult to characterize without the aid of figures. The larvæ are easily distinguished from all larvæ in Group I. by the elongated and vigorous mxp.[3], and from *S. sargassi*, Ortm., by the longer eye-stalks. In the old larvæ the sixth joint of mxp.[3] is divided into 4 subjoints (the oldest larval stage of *S. oculatus*, Kr., is unknown to me, so that I cannot settle whether its two distal subjoints are divided as in *S. edwardsi*, Kr.), but the armature on the end and on the interior margin is very different from that in the adults.

S. oculatus, Kr.—Kröyer has given a good representation (p. 243, tab. iii. figs. 5, *a–f*); Bate has also described and figured it (p. 406, pl. lxxiv. fig. 1). Both Kröyer and Bate figure, in my opinion, the eye-stalks a little too long. The rostrum is short, seen from the side obliquely triangular, acute, and rather broad at the base; the abdominal segments are dorsally smooth—even in a specimen but 6·5 mm. long—and on the ext. br. of urp. the exterior margin is ciliated in the total or almost the total length (in a larva 10 mm. long, c. $\frac{1}{17}$, measured with accuracy, of the length was naked). By the combination of these three characters the older specimens are easily recognized. The species is most decidedly the *Mastigopus* of *S. edwardsi*, Kr.—*S. brachyorrhos*, Kr. (p. 272, tab. v. figs. 13, *a–b*), is the young *Mastigopus* of *S. edwardsi*, Kr. I have examined Kröyer's type specimen, which is about 4 mm. long.

To his description it may be added that each of the four anterior abdominal segments possesses in the median line on the inferior side a protuberance or lobe, the three anterior of these ending in a spine; on the ext. br. of urp. the exterior margin is ciliated in $\frac{2}{3}$ of its length, thus a very short basal part being naked, but no tooth or spine is present.

S. vigilax, Stimps.—The description of Stimpson (p. 45) agrees rather well with the oldest *Mastigopus*, and no other species known to me agrees with it; his animals were captured at the Azores. Specimens c. 9–16 mm. in length are distinguished from the related forms by the following characters:—The rostrum about as in *S. oculatus*, Kr., but perhaps a little larger, directed upwards and forwards; in specimens 9–10 mm. in length the apex is produced into a short spine directed forwards. The eye-stalks are very long, obviously longer than in *S. oculatus*, Kr.; the eyes large. In the antenn. ped. the first and third joints are of about equal length. The abdominal segments are dorsally smooth, yet in specimens 9–10 mm. long with very short spines or traces of spines on the fourth, fifth, and sixth segments. On the ext. br. of urp. the ciliated part occupies from $\frac{3}{4}$ (in the younger specimens) to more than $\frac{4}{5}$ (in the older specimens) of the exterior margin, but the spine is generally obsolete. The adult form is described above, bearing the same name.—As already pointed out by Ortmann, *S. parvidens*, Bate (p. 409, pl. lxxiv. fig. 3), 9 mm. long, is established on younger specimens of *S. vigilax*, with dorsal spines on the fourth to sixth abdominal segments. Bate's figure gives a rather good idea of this stage. *S. macrophthalmus*, Stimps. (p. 46), is, in all probability, identical with the stage *parvidens*, Bate.

The smallest specimen seen by me (captured by Chun at the Canaries) is (the rostrum included) 4 mm. long, and differs considerably in several particulars from the older specimens, but is more similar to *S. brachyorrhos*, Kr. The rostrum is about $\frac{2}{3}$ as long as the eye-stalks, its short basal part broad, and at its end a dorsal spine, beyond which the rostrum is very slender. The supraocular and the hepatic spines are considerably elongated. The antenn. ped. extremely slender, only 2-jointed, as the second joint is not yet separated from the first; the third is not $\frac{1}{4}$ of the entire peduncle. The posterior margin of the carapace in the median line with a slender spine directed obliquely forwards (this spine is still preserved in specimens c. 8 mm. long, but then shorter and almost perpendicular). Each of the 6 abdominal segments with a dorsal spine, which is short and perpendicular on the first two segments, longer on the third, fifth, and sixth, very long on the fourth segment. The epimera of the 5 anterior segments produced into a short spine directed outwards; the same segments besides inferiorly in the median line with a lobe, which at least on the second segment is armed with a spine. The very narrow ext. br. of urp. with the exterior margin ciliated in scarcely more than $\frac{2}{3}$ of its length, and the spine is well developed. The telson very short as in *S. brachyorrhos*, Kr.

S. penerinki, Bate.—The specimen represented by Bate (p. 418, pl. lxxvi. fig. 3) is rather young, 8 mm. long. I have examined a number of specimens, between 6·4 and 14 mm. in length, partly from the Plankton expedition and partly from our museum. Specimens from c. 7·5 mm. to 14 mm. in length are easily distinguished from those of the same length of *S. vigilax*, Stimps., by having the third, fourth, and fifth abdominal segments—in the younger specimens also the sixth segment—dorsally armed with spines, which in larger specimens are shorter than in the stage figured by Bate, but yet well developed; the spine on the third segment is almost perpendicular. In older specimens the eye-stalks are somewhat shorter than in *S. vigilax*, Stimps., but yet long. In the older stages the rostrum is much shorter than in Bate's figure, but yet longer than in *S. vigilax*, and its distal part is slender and directed horizontally forwards; in the younger stages it is towards $\frac{1}{2}$ or more of the length of the eye-stalks and recalls somewhat that in *S. incertus*, m. (see below), but in specimens that have attained the length of 8 mm. it is destitute of a dorsal spine. In specimens c. 6·4 mm. long the rostrum is about half as long as the eye-stalks, with a very short dorsal spine a little way from its base. In the antenn. ped. the third joint is scarcely longer than the first. (In the young specimens the anterior abdominal segments are ventrally armed as described by Bate.) On the ext. br. of urp. the length of the ciliated part varies, as in *S. vigilax*, in accordance with the length of the specimens, occupying from $\frac{3}{4}$ to $\frac{6}{7}$ of the exterior margin; a tooth is present in the younger, not in the old specimens. The adult form is described above, bearing the same name.

S. incertus, m., is the *Mastigopus* of the adult described above. I have seen rather numerous specimens from 6·2 to 13 mm. in length. They are more slender than the corresponding stages of *S. penerinki*, Bate, which they closely agree with in the antenn. ped., the length of the eye-stalks, and the dorsal armature on the abdominal segments. But they are easily distinguished from this species by the ext. br. of urp., on which the ciliated part in all specimens occupies scarcely $\frac{2}{3}$ of the exterior margin, and the spine is rather long. Moreover, the rostrum, which in proportion to the length of the animal is from more than the half to scarcely $\frac{1}{3}$ of the length of the eye-stalks, is rather characteristic: seen from the side the basal part is rather short and directed obliquely forwards and upwards, and then it suddenly becomes produced into a slender and distally very fine spine much longer than the basal part and quite horizontal; at the distal end of the basal part *the upper margin is armed with a fine spine*, which is very short in the older specimens, *and just beyond which the margin is somewhat concave in outline*. In the young specimens the first two abdominal segments are ventrally in the median line armed with a lobe produced to a spine, and in these and even in specimens c. 10 mm. long the posterior margin of the carapace is armed with an erect spine.

That the referring of this *Mastigopus* to the above-described adult *S. incertus*, n. sp., is correct is proved by a specimen c. 17 mm. long, which constitutes an excellent transition. The rostrum has still essentially the larval shape, with a sharp angle as the trace of the dorsal spine between the oblique basal and the horizontal distal part, but the distal part is shorter than the basal and its upper margin concave as in the true *Mastigopus*. The eyes about as in the adult, but still brown, not black, the eye-stalks as in the adult. The sixth joint of mxp.^{3} essentially as in the adult, with 13 spines on the interior margin. The abdominal segments are dorsally smooth. On the ext. br. of urp. the ciliated part occupies scarcely more than $\frac{2}{3}$ of the exterior margin, and the spine is short.

S. armatus, Kr.—Kröyer's representation (p. 260, tab. iii. fig. 6, *a–e*) gives a good notion of this curious larva. Here I shall but mention some few essential characters. The rostrum is about as long as or a little shorter than the first joint in the antenn. ped., without any dorsal spine or angle. The eye-stalks are of medium length, considerably shorter than in the larvæ of *S. incertus*, m., and *S. penerinki*, Bate. In the antenn. ped. the first joint is *in the older specimens obviously somewhat shorter than the third*. Of the abdominal segments the second is dorsally armed with a shorter perpendicular spine, the third to fifth with very long oblique spines, much longer than in other species of the group, and, besides, the spines on the fourth and fifth segments are much curved. Sometimes a very short spine is present on the first segment, and finally in the younger specimens a short spine on the sixth. On the ext. br. of urp. the ciliated part occupies a little less than $\frac{2}{3}$ of the exterior margin, and the spine is well developed. The largest specimen is 15·5 mm. long.

That this *Mastigopus* does not belong to *S. incertus*, m., with which it agrees in the ext. br. of urp., is decided by the shortness of the first joint in the antenn. ped. in proportion to the third. Thus the adult form is unknown to me. Unfortunately all the specimens seen by me were captured in the Atlantic between lat. 42° 5′ N. and lat. 4° 5′ N., but Bate describes and figures (p. 401, pl. lxxiii. fig. 1) a specimen, 8 mm. long, which seems to be the same species, and the specimens seen by him were captured at "Port Jackson (Australia)," "north of the Sandwich Islands," and "between Japan and Honolulu;" thus it may be possible that it belongs to *S. halia*, Fax., captured in lat. 7° 6′ N., long. 79° 48′ W.

Of the 8 species enumerated at the end of the tabular view as belonging to Group II., *S. hamifer*, Alc. & And., *S. macrophthalmus*, Stimps., and *S. brachyorrhos*, Kr., are mentioned in the notes. The other 5 species are all larvæ. *S. diapontius*, Bate (p. 399, pl. lxxii. fig. 3), is very interesting, being 18 mm. long and easily distinguished from all other species of the group by having the second joint of the antenn. ped. "twice as long as the first;" this large larva, captured in the Atlantic, must belong to an unknown adult form—thus we obtain at least 7 valid species (*S. hamifer*, And. &

Alc., not included) of Group II. The 4 other larval species, all described by Bate, are established on very young specimens, between 3·5 and 7 mm. long, and are probably all or almost all but young stages of some of the species described above, but I have not been able to refer them with certainty.

viii. *Remarks on* Sciacaris *and* Petalidium *of Bate.*

To the genus *Sciacaris*, Bate, only one species, *S. telsonis*, Bate (p. 438, pl. lxxviii. fig. 1), has been referred, and this is a *Mastigopus*-stage, which agrees so closely with *Sergestes* that I must consider it as being the larva to a *Sergestes*-species, and in the tabular view given above I have referred it to Group I.

The genus *Petalidium*, Bate, was established on one species, *P. foliaceum*, Bate (p. 349, pl. lx.), which is very deficiently known as the specimens were extremely mutilated, without legs and with the uropods broken off. But the branchiæ are very interesting. Bate ascribes its arthrobranchiæ to mxp.^{3} and trl.^{1}–trl.^{3}, but according to his analytical figure I believe them rather to be pleurobranchiæ as in *Sergestes*; besides, he mentions and figures large foliaceous plates to trl.^{1}, trl.^{2}, and trl.^{3}, answering to the lamellæ in *Sergestes*. I should not have mentioned this interesting but very imperfectly known form if I had not met with rather similar pleurobranchial lamellæ in *S. sanguineus*, Chun (Sitz. d. k. Preuss. Akad. d. Wiss. zu Berlin, 1889, p. 538, Taf. iii. fig. 1).

According to a careful comparison between the largest type specimen of *S. sanguineus*, Chun, 9·5 mm. long, and Kröyer's representation of his *S. obesus*, Kr. (p. 257, tab. iv. figs. 10, *a–f*), and the fragments of his single type specimen, the two species are identical, and the name given by Kröyer must be adopted. The largest specimen seen by me is a *Mastigopus*, perhaps not more than half-grown. For the recognition of the species it may at once be mentioned that several very characteristic particulars have been figured: thus Kröyer figures the eye, the antennular peduncle, and the uropods, and mxp.^{3} and the trunk-legs are represented by Chun. Next I shall give a short description of the largest specimen. The rostrum is rather short, considerably shorter than the diameter of an eye, almost horizontal, slender, with a dorsal spine at the basis. No supra-ocular spines, but the hepatic spine and the gastro-hepatic groove are well developed. The eye-stalks rather short, but the eyes nevertheless reaching beyond the second joint of the antenn. ped., the eye-stalk with the eye, seen from the side, inverted conical, and the distal part of the cornea forming almost a hemisphere at the end of the cone—a shape very different from that in the *Mastigopus* of *Sergestes*. The antenn. ped. is short, the first joint much longer than the other two taken together, thus longer than in any above-described *Mastigopus* of the same length. Mxp.^{3} very short, somewhat longer than trl.^{1} and very little longer than trl.^{3}; *trl.^{3} is almost* 3

times longer and its proximal half considerably more incrassated, near and on the apex with some long setæ and without the trace of any chela; on trl.^{3} a feeble beginning to a chela is found. The relative length and the structure of mxp.^{3} and trl.^{1}–trl.^{3} differ very much from that found in *Sergestes*. The branchiæ are very interesting. A rudiment belonging to mxp.^{2} I do not dare to interpret: above mxp.^{3} and trl.^{1}–trl.^{3} a small pleurobranchia and a plate are present; the plate above mxp.^{3} is a little larger than the branchia, and the plates are much increasing in size from before backwards, so that the plate above trl.^{3} is 3–4 times larger than the branchia; above trl.^{4} a rudimentary branchia. The abdomen is rather clumsy, dorsally smooth; the ext. br. of urp. with the exterior margin naked in c. $\frac{1}{3}$ of the whole length, as the well-developed spine is situated near the distal end.

The smallest specimen examined is 4·9 mm. long, and differs from the described stage in several particulars of not much importance—a somewhat different shape of the rather short rostrum, a well-developed supra-ocular spine, trl.^{4} and trl.^{5} only buds, the branchiæ not yet developed, a short dorsal spine on the fifth and sixth abdominal segments, the spine on the ext. br. of urp. still nearer to the apex, &c.

It is easily seen that this species cannot remain in the genus *Sergestes*, but whether it should be referred to *Petalidium*, Bate, or a new genus should be established for its reception is impossible to decide with certainty. The branchial plates recall the plates found in *Petalidium*, and therefore I provisionally transfer it to that genus; but we must call to our remembrance that the branchial plates or lamellæ may be much altered during the further growth, for instance they may be proportionally much reduced in size (*cfr.* the curious reduction of the branchial lamellæ in *S. henseni* (Ortm.) during its development from a *Mastigopus* 6·2 mm. in length to the adult form). Unfortunately the legs and the uropods in *Petalidium* are quite unknown. The species, which must receive the name of *P. obesum* (Kr.), is decidedly distinct from *P. foliaceum*, Bate.

ix. *Geographical and Bathymetrical Distribution.*

With one single exception all the species of *Sergestes* are only found in the tropical and subtropical seas, in the Atlantic reaching northward about to lat. 42°–43° N. The exception is *S. arcticus*, Kr., which ranges to the seas at the southern part of Greenland; but being distributed to the Mediterranean, and even to lat. 38° S., it is in reality no arctic species but a deep-sea form, with the centre of distribution in all probability towards the northern tropic or the Equator, and notwithstanding going c. 20° more northward than the other allied species.

The limits of the geographical range of the species are still very imperfectly known. Above I have mentioned that some of Bate's localities for *S. atlanticus*, M.-Edw., were uncertain, and that Bate's,

Ortmann's, and Faxon's specimens of *S. edwardsi*, Kr., must be re-examined, as the species is collective; thus some of the localities given in the literature of the subject are untrustworthy and several others are, in my opinion, not quite certain. But the statements given above as results of my own studies of the animals prove with absolute certainty that at least a series of the species have a very wide distribution: the Atlantic northward to lat. 23°–30° N. and mostly to lat. 42° N., the Indian Ocean, and at least the most western part of the Pacific. From the other parts of the Pacific I have seen no material.

Bate writes on p. 352: "The species of this genus [*Sergestes*] are chiefly oceanic"; and this is, I think, generally admitted. But partly according to the foregoing investigation this statement must be rather altered, for we must distinguish between the larvæ and the really mature forms. *Almost all known larvæ have been taken at the surface.* Yet it must be remarked that at least in short distance from the shore some *Mastigopus*-species generally are met with in considerable depths. This is proved by Prof. Chun, who in 1889 (p. 538) writes on his "*S. longirostris*, Bate": "Er war der häufigste aller Sergestiden [at the Canary Islands] und fand sich regelmässig in dem Inhalt der Tiefennetze. . . . . Seltener erschien er an der Oberfläche." Later on he captured different larger *Mastigopus*-stages of *S. mediterraneus*, m., and *S. arcticus*, Kr., with intermediate-net ("Schliessnetz"), near Lesina and Ragusa at 80, 100, 400, 500, and 500–600 metres, but all the *Mastigopus*-stages of *S. arcticus*, Kr., are not uncommon near the surface in the northern area of the Atlantic.

While all the larvæ, according to our present knowledge, are essentially oceanic near the surface, the adult forms give another result. I have accepted at most 14 earlier described mature forms as valid species, and of these 8 species—*S. inous*, Fax., *S. robustus*, Smith, *S. japonicus*, Bate (=*S. mollis*, Smith), *S. bisulcatus*, Wood-Mason, *S. prehensilis*, Bate, *S. kröyeri*, Bate, *S. rubroguttatus*, Wood-Mason, and *S. hamifer*, And. & Alc.—have *only* been captured with trawl or dredge between 345 and 2574 fathoms. The other 6 species must be treated separately. *S. arcticus*, Kr., is typically (see Metzger, Chun, and especially the long lists given by Smith) an inhabitant of the deep sea, and only some younger specimens with black eyes have been secured at the surface, and one single really mature specimen (the type of Kröyer) in all probability near the shore. Of *S. henseni* (Ortm.) 2 smaller specimens (not 3, as written by Ortmann), the largest specimen about 24 mm. in length, were captured with the vertical net between 400 and 0 m., while a much larger specimen (35 mm. long) was taken with the trawl from 4000 m. The depth of *S. halia*, Fax., is not recorded, as the specimens were taken with a submarine tow-net; and if *S. armatus*, Kr., is the *Mastigopus* to it, it is certainly no surface species, as *S. armatus* is not very rare in the northern part of the Atlantic, where no adult-form which can belong to it has been secured. *S. atlanticus*, M.-Edw., is very

common at the surface, but Ortmann communicates that it has been captured in the intermediate net from 700–500 m.; and if some of the specimens recorded by Bate (p. 390) as 38, 43, and 50 mm. long, and coming respectively from 600, 2150, and 345 fathoms, really belong to this species, it grows considerably larger in the deep sea, as no specimen from the surface exceeds 30 mm. Finally, *S. cornutus*, Kr., and *S. edwardsi*, Kr., are the only instances of the 14 species which only have been captured at the surface (and in vertical nets drawn up from 500 m. to the surface). In this paper I have described the mature forms of *S. vigilax*, Stimps., H. J. H., *S. penerinki*, Bate, H. J. H., and *S. incertus*, n. sp., which have all been captured at the surface. *S. tenuiremis*, Kr., H. J. H., and *S. corniculum*, Kr., H. J. H., are common at the surface in the *Mastigopus*-stages; above I have described the younger black-eyed forms of both species, also captured at the surface, but the adult stages are quite unknown and must, in my opinion, be true deep-sea forms. Of *S. diapontius*, Bate, and *S. mediterraneus*, m., only the *Mastigopus*-forms are known, and the adults are certainly inhabitants of the depths. (*S. profundus*, Bate, from 1375 and 2550 fathoms, I omit, as the species is too uncertain.)

Though we still know too little of the bathymetrical distribution, it must, I think, be taken as proved *that at least two-thirds of the species inhabit the depths of the sea when the animals have quite arrived at maturity* (or at least at their full length, cfr. *S. atlanticus*). I can say that with two exceptions—my single adult specimen of *S. incertus*, m., and Kröyer's specimen of *S. arcticus*, Kr.,—no specimen exceeding 30 mm. in length recorded in the existing literature or seen by me has been captured near the surface, but all large specimens, from 30 mm. to 113 mm. (*S. inous*, Fax.) in length, have been secured with trawl or dredge coming from a considerable to a very great depth (345–2574 fath.). Faxon writes on p. 249: "There can be no doubt that the deep-sea Crustacea occasionally come to, or very near to, the surface," and he communicates several instances; I think that, for instance, my single and large specimen of *S. incertus*, m., 47 mm. long, has been secured on such a visit. It is evident that the animals as true swimming forms do not live on the bottom itself, but, I presume, in the water-stratum just above it.

As will be seen from this paper, our knowledge of this rich and curious genus is still rather imperfect. A good monograph, based on the study of the collections in the seven or eight museums which possess materials of importance, would be extremely valuable and elicit numerous new facts; and future deep-sea expeditions, making use of the trawl, intermediate net, vertical net, and surface net, would be sure to discover new species and especially enlarge our knowledge of the metamorphosis and distribution.

7. On the General Results of a Zoological Expedition to Madagascar in 1894–96. By C. I. Forsyth Major.[1]

[Received December 1, 1896.]

I arrived at Mananjary, on the east coast of Madagascar, at the end of August 1894, and embarked at the same place almost two years later, on July 11th, 1896. My original intention had been to hurry on at once, by the most direct route, to Sirabé, situated on the central plateau, at about 12 days' journey to the N.W., in order to profit of what remained of the dry season for the intended excavations in the marshes. The impossibility of finding bearers for the little-known and difficult direct route obliged me, however, to travel first to Fianarantsoa, the capital of the Betsileo, situated in a S.S.W. direction, at 7 days' distant from Mananjary. At Fianarantsoa I had to wait 22 days for the bulk of my luggage, which, according to previous arrangements, ought to have arrived before myself. I employed the time in doing such collecting work as the circumstances would allow. In the meantime, the news arrived of sudden complications in the political situation, and all the Frenchmen residing in the interior left for the coast, with the exception of my young assistant, whom, a little too late in the day, I tried to give out as a British subject.

As there was still some hope left that the Hovas would yield to the French ultimatum, I decided to leave for what I thought would prove a quiet corner in the forest of the Tanala, N.E. of Fianarantsoa, and there to await the events, and eventually the end of the war, which it was supposed would be of very short duration. My subsequent difficulties with the Tanala Governor were of a somewhat more serious nature than I wished to describe in my letters; I have to mention it here, as it considerably interfered with my work. The collecting work in the forest extended from October 1894 to the beginning of February 1895, interrupted in December by a journey to the Betsileo town of Ambositra, in order to communicate with the few Englishmen residing there, and by their help with the British Vice-Consul in Antananarivo.

The first six weeks of my stay in this district we were encamped in the midst of the forest, near Ivohimanitra, at from 1000 to 1100 metres above the sea. The second stay was at Ambohimitombo, a short day's journey N.W. from the latter place and some 400 metres higher up. As I then supposed that later on I would have no more opportunity to visit the forest-region, I determined to collect everything that would come in my way. From this system I had completely to depart in the sequel. Being much dependent on the cooperation of the natives, I soon found out that it was very difficult to train them for a manifold collecting work. Besides, I had after a while to convince myself that I was only able to do fruitful work in what I was best acquainted with. In my subsequent stays in the forest therefore, without leaving

[1] Communicated by the President.

behind what of supposed interest came into my way, I chiefly limited myself to the collecting of Mammals, which, with a little training of the natives, came in, later on, in such abundance, that we often found it impossible to master all the work. This is also the reason why I shall refer this evening, so far as the recent fauna is concerned, almost exclusively to Mammals, leaving to my friends to make such additions as they may think proper when all the material has been distributed.

My first collection from Ivohimanitra was to be conveyed to Ambohimanga, the capital of this part of the Tanala country, and from there to be sent to the coast, in accordance with previous arrangements with the Norwegian Missionary stationed at Ambohimanga. We ourselves had to escort our things to the latter place, but after all, owing to the breaking out of the war, no goods could be sent from there to the coast; so that I was obliged to carry back, farther in the interior, what I could, leaving part of the things, for want of bearers, at the Mission Station.

The Betsileo town of Ambositra, on the central plateau, proved subsequently to be a favourable central place for the forwarding of my collections, and thither I resorted from the forest, and in the sequel more than once from Sirabé, having generally myself to accompany the caravans. The final packing of the collections was mostly effected at Ambositra, and had always to be done with the greatest care; I have no reason to complain of the great amount of time employed in packing. In the intervals of these occupations some good collecting work was carried on at Ambositra as well. Finally, in March, I left Ambositra for Sirabé, to learn only then, from the Rev. Mr. Rosaas, the discoverer of the fossil bones at Sirabé, who had himself been collecting in the marshes for over 20 years, that it would be impossible to excavate in the marshes for the next following months, on account of the great quantity of water. This proved to be true, so I had to content myself for the beginning with the exploration of a small cave, and to set to work again at collecting the recent fauna of the neighbourhood, with satisfactory results in both directions. The cavern yielded some bird-remains and egg-shells of *Æpyornis*, but chiefly small mammals. This exploration I have come to consider an interesting complement to the subsequent excavations in the marshes; although, as was to be expected, I subsequently found still existing in different parts of the forest most of the new Mammals discovered in the cave.

Different attempts to begin a systematic exploration of the marshes had always to be abandoned again, partly on account of the season and partly on account of the unfriendly behaviour of the population. Finally, losing patience, I left Sirabé, crossed over the whole central plateau to the east, and settled in the forest at Ampitambé, on the border of the Betsimisaraka country, in the hopes to hear soon of the arrival in Antananarivo of the French column and of the end of the war. It happened otherwise, however. My collecting work at Ampitambé proved

very successful, thanks chiefly to the cooperation of the natives, Betsileos and Betsimisarakas; but the French never came. The result was, that in the beginning of September 1895, after having despatched my collections *via* Ambositra, I returned to Sirabé and searched earnestly for the *Æpyornis*—at the best time, with regard to the condition of the marshes; at the worst, with regard to that of the country generally. Three times I was compelled to interrupt the work, once for a whole week. To make up for lost time, I engaged in the intervals as many workmen as presented themselves, generally more than fifty. When at last the rainy season stopped the business, I found that after all the result was more than I had expected; my collections were far superior to what any previous collector had brought together in many years. I have to acknowledge with thanks the Rev. Mr. Rosaas's friendly help at this place, especially in using his influence with the natives on our behalf.

The rest of the Odysey can be told in a few words. First a forced stay of nearly two months in the capital; a short sojourn of some weeks in the forest of Ankeramadinika, at a day's journey to the east, where not much was to be done, owing chiefly to the growing unfriendliness of the Hovas towards all Europeans. Still some good things, including a new Lemur, were secured here. Later on, I travelled south again, settled in the old place Ampitambé, with equally good results as the first time; the work, however, was unfortunately interrupted by the unsafety of the place. Lastly, a lengthened sojourn was made in a more southern region, viz. near Vinanitelo, in the forest of the independent Tanalas, 30 miles south of Fianarantsoa. Here some attempts to make excavations were without result; but good work was done in collecting recent mammals, as the following statement may show:—at the end of my first stay at Ampitambé 804 specimens of recent Mammals had been collected; when I left Vinanitelo this figure had been more than doubled.

Some general remarks on the results of my excavations at Sirabé may not be out of place here. The mammalian remains found were few, and on this account the locality cannot be said to be a very favourable one; besides there were difficulties of various kinds connected with the excavations and more or less inherent to the locality. The predominant feature of the fossil fauna of Sirabé in general is the great rarity of strictly terrestrial vertebrates. Apart from the *Hippopotamus*, which is numerous in the superficial deposit as well as lower down, the only mammalian remains found are a lower jaw of a *Centetes*, scanty remains of Rodents (which, to judge from a pelvis, belong to a Murine of considerable dimensions), some bones referable to *Potamochœrus*, and finally the remains of two species of a remarkable new family of Monkeys, chiefly represented by an incomplete skull, part of a lower jaw, milk-dentition, humerus, &c., some of which I have preliminarily described in the October number of the 'Geological Magazine' under the name of *Nesopithecus*. It will be more fully

described and its relationships discussed in a paper under preparation.

The *Avian* collections are there to prove that if the Mammals for which I was anxiously looking out did not come in in greater numbers, it was not for want of careful investigation. The collection of Birds' remains was partly damaged, partly destroyed by the falling in of the ceiling of my house at Sirabé, in which they were placed for drying. Fortunately there remains enough. The *Æpyornis* bones, some thousand in number, form the great bulk of the collection; the family is here represented by two species of *Æpyornis* and one of *Mullerornis*. One smaller species is predominant, and of this we shall be able before long to put together an almost complete skeleton, as the smaller and rarer parts, such as sternum, coraco-scapula, cerebral vertebræ, phalanges, &c., are all at hand. Six more or less complete skulls of the smaller species of *Æpyornis* were obtained.

The *Carinatæ* are represented by several hundred bones, belonging chiefly to aquatic birds. Mr. Andrews will be so good as to give some further particulars about the birds' remains. Of the rest the collection will speak for itself.

Of recent Birds I collected chiefly skeletons; and I hope to have done a useful work in bringing home over 160 birds' skeletons.

Of recent Mammals many hundred specimens have been obtained; of numerous species whole series, including skins, skeletons, and spirit-specimens.

Lemuridæ.

Of Lemuridæ examples of 13 species have been collected, amongst which two (*Lepidolemur microdon* and *Chirogale melanotis*), preserved in the National Museum, were known only by a single specimen each. Amongst the number is one new species, a *Chirogale*, and besides this some remarkable varieties of others.

There is a curious character in the skull of Malagasy Lemurs, to which attention was first drawn in 1835 by a Swiss anatomist, Hagenbach, who observed it in a species of the genus *Lemur*; the same was later (in 1845) more fully described by Hyrtl in two species of the same genus: the tympanic ring is completely enclosed by the bulla ossea, but without osseous connection with the same. Winge has stated that this peculiarity holds good with regard to all the Malagasy Lemuridæ which have come under his observation, including *Chiromys*, and he therefore places them in a separate family. It is in fact of general occurrence amongst the Lemuridæ of the island; and having found other peculiarities in their skull besides, I have come to range myself with Winge's opinion, so that we have to consider *Chirogale*, *Opolemur*, and *Microcebus* as being more nearly related to the rest of the Malagasy Lemurs than to the African genus *Galago*.

Carnivora.

Examples of 5 species were collected, which for the present call for no special remarks. The *Cryptoprocta ferox* is amongst them.

Insectivora.

Of Malagasy Insectivora 14 species were known when I left Europe, viz. 13 *Centetidæ* and 1 *Crocidura*, not taking in account one *Crocidura* apparently introduced from India. All of these, with the exception of three (*Echinops*, *Geogale*, and *Microgale crassipes*), are represented in my collections. Of one species, viz. *Oryzoryctes tetradactylus*, which before was known only by one immature specimen in Paris, and one skin without the skull in London, I have brought back upwards of 150 specimens of all ages. Of another rare form, *Microgale dobsoni*, known only by an imperfect young specimen in the National Museum, there are also numerous specimens. Besides I have come upon 9 new species, all of them Centetidæ, bringing the number of this Malagasy family up to 23, the number of insectivorous species brought home by myself being 20, viz.:—1 *Crocidura*, 1 *Centetes*, 2 *Ericulus*, 2 *Hemicentetes*, 1 *Limnogale*, 4 *Oryzoryctes*, 9 *Microgale*.

I have elsewhere[1] published short descriptions of most of the new species, but have not yet begun the proper working-out of this rich material; I therefore limit myself to a very few general remarks.

The Tanrec, *Centetes ecaudatus*, which is often considered to be the type of the family Centetidæ, is certainly in several respects the least typical of them all, being very much specialized in various directions.

One remarkable form, modified for aquatic life, for which I have proposed the new genus *Limnogale* (*L. mergulus*), deserves special mention. It is almost of the size of *Mus rattus*, furnished with webbed toes, a powerful laterally compressed tail, short, broad, and flattened head, large infraorbital foramen, &c. The clavicles are present, whilst in the African *Potamogale* they are wanting.

Amongst the smaller species with soft hair, we meet with all gradations from forms highly fossorial (*Oryzoryctes*) to others in which the fossorial adaptation is reduced to a minimum, or may be altogether wanting (genus *Microgale*). Some of these last represent apparently the primitive stock of the family. It is from forms not dissimilar to these that a group of highly specialized African Insectivora may have taken their origin, whilst *Centetes*, itself a specialized creature, with a brain atrophied before being quite adult, cannot possibly have become the progenitor of fresh offshoots.

Chiroptera.

For want of time the Bats have been only very superficially examined. My last collections having arrived only a short time ago, a certain number of specimens are still enclosed in the tin boxes.

There seem to be about 12 species represented, of which one is certainly new for Madagascar; only one *Vespertilio* being known, whilst my collections contain specimens of two species of the genus.

[1] See Ann. & Mag. Nat. Hist., Oct. and Dec. 1896.

Potamochœrus.

The Wild Hog of Madagascar, of which the National Museum contains the skin of a young specimen, figures in my collections with 11 specimens, male and female, adult and young, and complete skeletons. The species has been named, but never described, and will have to be compared with the *P. africanus*, with which it presents more affinity than with *P. penicillatus*. To judge from the characters of the dentition, the same type is represented in the Siwaliks (*S. hysudricus*) as well as in the Upper Miocene and Pliocene of Europe, Eppelsheim, Montebamboli, Casteani, &c. (*S. palæochœrus* and *S. chœroides*).

Hippopotamus.

Filhol is of opinion that there are three subfossil *Hippopotami* in Madagascar. There are certainly two on the west coast, to judge from the remains in the National Museum. My material comes from Sirabé, and the species may be different from those on the west coast. For the present, the question of one species more or less is a secondary one to me. All the Hippopotamus remains from Madagascar, those in the British Museum as well as those collected by myself and those preserved in Christiania and Paris, are certainly nearly related to each other, and this relationship may be briefly summed up as follows:—In size they are intermediate between *H. liberiensis* and *H. palœindicus*; in more important characters they would have to be placed, according to their greater or lesser degree of specialization, between *H. sivalensis* and *H. palœindicus* on one side, and *H. amphibius* on the other; one end of the whole line being occupied by the most generalized form, *H. liberiensis*, existing in W. Africa, and the other by the most specialized one, *H. major* of the Upper Pliocene of Europe. The whole series would be as follows:—

H. liberiensis.
H. iravadicus.
H. sivalensis.
H. palœindicus.
H. madagascariensis, *H. merlei*, &c.
H. amphibius.
H. major.

I have called the *H. liberiensis* the most generalized form; this does not hold good certainly as to the number of its incisors, in which respect it is very much specialized. The particulars of the cranium have almost the value of family characters, as by them it approaches the extinct genus *Merycopotamus* and the Suidæ, and appears to be, as was pointed out by Gratiolet, less aquatic and especially less exclusively herbivorous than *H. amphibius*. Compared with the other members, and especially with *H. amphibius* and *H. major*, one of the most striking differences lies in the relative proportion of the cranial and facial portion of the skull, the first being greatly

developed in *H. liberiensis*, whilst in *H. amphibius* and the *H. major* of the Upper Pliocene the cranial portion is much reduced, the facial portion on the contrary enormously produced. In connection with this is the great elongation of the frontal bones of *H. liberiensis*, whilst they are broad and short in *H. amphibius* and *H. major*. *H. sivalensis* is still very near *H. liberiensis* in this respect, the antero-posterior extension of the frontal being, as was shown by Falconer and Cautley, twice as great as in *H. amphibius*. An expression of the relative proportion between the anterior and posterior portions of the cranium is given by the position of the orbits. The various Hippopotamus crania from Madagascar have, in this respect, much resemblance with *H. sivalensis*, the cranial portion being, however, somewhat more shortened, the facial portion somewhat more lengthened; so that the orbit occupies a less central position than in *H. liberiensis*, and, as a matter of course, still less so than in *H. sivalensis*. The Malagasy forms thus constitute a step farther in the direction of *H. amphibius*, the breadth of the intraorbital region being much less than in the African species and the same as in *H. sivalensis*.

These changes are reflected by the position which the lachrymal occupies. In *H. liberiensis*, as shown by Leidy, who had at his disposal the skull of a younger animal, exhibiting distinctly all the sutures, the lachrymal is entirely separated from the nasals by the anterior prolongation of the frontal, which last thus comes in contact with the maxillary. This is, with the exception of the Ruminants, almost the rule in Ungulates. As to *H. sivalensis*, in six out of seven skulls figured in the 'Fauna Antiqua Sivalensis' the sutures are distinctly to be seen; and we find here again the lachrymal excluded by the frontal from contact with the nasal and joining the maxillary. The originals of most of the skulls figured being in the National Museum, I have had an opportunity of verifying the accurateness of the drawings, so that we may fairly conclude that *H. sivalensis* had, as a rule, the character mentioned above in common with *H. liberiensis*. The same is the case with regard to *H. palæindicus*, as shown in the F. A. S., with the slight difference that the anterior tongue of the frontal is somewhat shortened.

In the Malagasy *Hippopotami* we find, as a rule, the following relations in this part of the skull. The lachrymal departs from the orbital margin in an inward direction and reaches the nasal, with which it unites, thus shutting out the frontal from a connection with the maxillary. Anteriorly to the lachrymal, exactly corresponding to the place which in *H. liberiensis* and *H. sivalensis* is occupied by the foremost tongue of the frontal, we find here a separate bone of various dimensions, interposed between the nasal and lachrymal, and touching the maxillary in front and sometimes the malar bone as well. In *H. amphibius* the lachrymal is usually broadly interposed between the frontal and maxillary; but in young specimens we meet occasionally with the same supranumerary bone; sometimes, as in *H. liberiensis* and *H. sivalensis*,

the frontal joins the maxillary, thus separating the lachrymal and nasal; and, besides, there is such a variability in the size and mutual connections of the bones in this part of the skull in young specimens, and, to a certain extent, in adult ones as well (four nasals, obliteration of the lachrymo-frontal suture, &c.), that we cannot here enter into more particulars.

My purpose was to show that, in respect of the above characters also the Malagasy *Hippopotami* are intermediate between *H. sivalensis* and *H. amphibius*, and appear to be in close relationship with both. Occasionally young specimens are hexaprotodont, as the Siwalik forms.

I think that, from what I have stated, we are fairly entitled to surmise that the Hippopotami entered Africa at a time when they were still in possession of all the characters of the Siwalik species, and that they crossed over to Madagascar when they had reached a condition intermediate between *H. sivalensis* and *H. amphibius*. In this condition they persisted in Madagascar, whilst on the neighbouring continent they progressed (or retrogressed) farther in the same direction. It is a curious circumstance that the *Hippopotamus major* from the Upper Pliocene of Italy has gone beyond *H. amphibius* in the same specialization; this may have had something to do with its earlier extinction.

Rodentia.

But little attention has hitherto been paid to the Rodent fauna of Madagascar. Although four or five more or less nominal genera had been founded, it has been surmised that the Malagasy Rodentia have immigrated in recent times and are not even specifically Madagascar genera. This supposition rests on the assumption that the Rodents are, as a rule, passively wandering (Wallace, Zittel), and was made in spite of Peters having long ago pointed out that *Nesomys*, the first known Malagasy Rodent, resembles the American *Hesperomyes* in the conformation of the enamel and in the proportions of its molars [1].

My collections contain some hundred specimens of Rodentia, belonging to five genera and eight species, five or six of the species and two genera being new, besides two new genera found in a fossil condition. This material I have begun to work out, and, although my investigations are far from being completed, I do not think that the following conclusions will hereafter have to be modified in their main points.

The great majority of Malagasy Rodents at present known, viz. the genera *Nesomys*, *Hallomys*, *Gymnuromys*, *Eliurus*, *Brachy-*

[1] "Eine neue Gattung der Murinen aus Madagascar, welche in dem Zahnbau sich am nächsten den *Hesperomys* der westlichen Hemisphäre anschliesst, und so ein neues Beispiel von der geographisch so merkwürdigen Verwandtschaft der Fauna von Madagascar mit der von Amerika liefert ..... Die Backzähne $\frac{3-3}{3-3}$, in ihrer Schmelz bildung und Proportion ähnlich denen von *Hesperomys*." (Sitzungsber. Ges. naturf. Freunde Berlin, Oct. 18, 1870, pp. 54, 55.)

uromys, *Hypogeomys*—*Brachytarsomys* stands somewhat apart from the others and requires further investigation—belong to the so-called Cricetine group of Muriform ("Muridæ," auct.) Rodents, of which they are the lowest of existing forms, having affinities with some of the least specialized of the family Dipodidæ, as defined by Winge, viz. to *Sminthus* and *Zapus*.

The African and Asiatic *Rhizomyes*, usually considered as belonging to the Spalacidæ, but which the last-named author places amongst the lowest Muridæ, alongside with the tertiary *Cricetodon* and *Eomys*, are nearly related to the Malagasy group of Rodents by means of the Abyssinian *Tachyoryctes* (*Rhizomys*) and the Malagasy *Brachyuromys*, the former being but a very specialized fossorial form of the more generalized *Brachyuromys ramirohitra*. The molars are almost identical in both, only but slightly more hypselodont in *Tachyoryctes*. If we divest the *Tachyoryctes* skull of its fossorial characters and of the consequences of the more hypselodont molars, we obtain a *Brachyuromys* skull. Likewise the skulls of the young *Tachyoryctes* bear much greater resemblance to *Brachyuromys* than the adult. There is further a great correspondence in external characters if we disregard the smaller ears and eyes of *Tachyoryctes* and its fossorial claws.

As to the affinities of the Malagasy Rodents with the lower Dipodidæ, they are revealed by the skull as well as by the conformation of the molars. The infraorbital foramen is large throughout and especially in *Brachyuromys*, though on the whole showing the form characteristic for the Muridæ[1], the posterior part of the zygomatic arch is bent downwards, the malar bone strongly developed and approaching the lachrymal more than in any other Muridæ, the size and shape of the incisive foramina nearly approaching what obtains in the Dipodidæ, &c. With regard to the teeth, the group of Malagasy Rodents, together with the Abyssinian *Tachyoryctes*, differ in a very important condition from the more specialized Murinæ, and even from the Cricetine Rodents, in having their molars of almost equal size and form; the two anterior molars especially are very much like each other. This likewise is a character in which they approach the lower Rodents, especially the Dipodidæ; in the pattern of the molars there is equally a strong resemblance of them all with Dipodidæ (*Sminthus*, *Alactaga*, *Zapus*); in this respect the mosaic pavement-like triturating surface, both in the Malagasy *Gymnuromys* and the Nearctic *Zapus*, is especially noteworthy.

The relation of the Madagascar Rodents to *Cricetus*, which is considered to be the type of the group, is viewed by me as

[1] The miocene *Paciculus*, from the John-Day beds in N. America, is considered by Scott to stand in most respects in an intermediate position between *Protoptychus* (which Scott supposes to be the ancestral form of the Dipodidæ) and the Dipodidæ, although it has lost all the premolars, and the lower portion of the infraorbital foramen forms, as in the Muridæ, a distinct notch for the passage of the nerve. ("*Protoptychus hatcheri*, a new Rodent from the Uinta Eocene," Proc. Ac. Nat. Sc. Philadelphia, 1895, p. 269.)

follows:—*Cricetus* is a terminal form amongst its congeners, somewhat connected with the Malagasy Nesomyinæ by means of the miocene *Cricetodon*, from which it is probably directly derived.

I have lastly to consider the affinities of the Malagasy Rodentia with the American *Hesperomyes*, urged by Peters with regard to the molars of his genus *Nesomys*. The resemblance is certainly striking between the pattern of the *Nesomys*-molars and of some of the bunodont *Hesperomyes*, and this resemblance extends alike to the form of the skull in both groups (conformation of the boundaries of the infraorbital foramen, small size of the tympanics, &c.). There exists more agreement between these two groups than between them and *Cricetus* and its Old-World allies. On the other hand, the Malagasy Rodents present unmistakable family features of their own, which all point in one direction, stamping them as lower, more primitive Muridæ than the *Hesperomyes*. The two anterior, and in some cases all three, molars are more like each other in size and pattern, although in this respect the difference is much less striking between the American *Hesperomyes* and the Malagasy *Nesomyes* than between the first and the Murinæ. Similar remarks apply to the skull: the infraorbital foramen is larger in the Malagasy mice, the malar bone always stronger developed and extending farther forwards and upwards towards the lachrymal &c.

Zittel is of opinion that all the Myomorpha of South America are recent, having immigrated from the north towards the end of the Diluvium [1]. The reasons for supposing this are, that so far only hystricomorphous Rodents have been met with in the older formations, the (Patagonian and) Santa Cruz beds. Here it must be borne in mind that the presence of a premolar and the pattern of the molars approaching the Hystricomorpha are not sufficient criteria for assigning to these latter several small Rodents of the Santa Cruz beds, of which the only parts preserved are the teeth. On the contrary, if there exist forerunners of the Muridæ in the Santa Cruz beds, they are likely to have possessed premolars. If the *Rhizomyes* and the Malagasy *Brachyuromys* possessed premolars—and there is strong evidence that this was recently actually the case—we would be inclined, without knowing more of them than their molar series, to assign them to the Hystricomorpha.

As matters stand at present, it must be admitted that all appearances speak against the ancient domicile of the *Hesperomyes* in South America, whereas we have in the miocene of North America such forms as *Eumys* and others, which might be considered to be the ancestors of the *Hesperomyes*. Moreover, *Cricetodon* of the European Miocene is more closely related to the *Hesperomyes* than to *Cricetus*.

There is therefore at present not sufficient evidence of a *direct* relationship between the Malagasy Rodents and the western *Hesperomyes*, although it seems to me difficult to explain their affinities as a result of mere convergence.

[1] Handbuch der Palaeontologie, 1, iv. p. 556.

I should again like to record my renewed thanks to the President and Council and Committee of the Royal Society for their valuable assistance, which has enabled me to carry on this work, aided by the liberality, first of all, of the Hon. Walter Rothschild, as well as of Mr. F. Du Cane Godman, Sir Henry Peek, and Mr. Alhusen.

I desire as well to express my very grateful thanks to Sir William Flower, Director of the Natural History Museum, and all the other officers, first of all Dr. Henry Woodward, who have done so much to enable me to carry out the objects of the expedition.

In conclusion it is my duty to speak in the highest terms of the intelligence, pluck, and perseverance displayed by my young assistant, Mr. Alphonse Robert, who refused to leave me when his life was in danger from staying with me.

December 15, 1896.

Lt.-Col. H. H. Godwin-Austen, F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of November:—

The registered additions to the Society's Menagerie during the month of November were 52, of which 31 were by presentation, 13 by purchase, 2 by exchange, and 6 were received on deposit. The number of departures during the same period, by death and removals, was 126.

Amongst the additions was a fine young male of the Arabian Gazelle (*Gazella arabica*) from Aden, presented, Nov. 30th, by Mr. R. G. Buchanan.

Mr. Sclater exhibited two bound volumes of original water-colour drawings by Wolf and Waterhouse Hawkins, belonging to the Knowsley Library, which had been kindly lent to him for examination by the Earl of Derby. These drawings were of very great interest to zoologists, as containing many of the originals from which the figures in the two volumes of the 'Gleanings from the Knowsley Menagerie' and Wolf's 'Zoological Sketches' had been taken.

The first and larger-sized volume (29 in. by 22 in.), lettered on the back 'Wolf's Original Drawings,' contained twenty-two water-colour drawings by Wolf, of which a manuscript list in the volume, written by Mr. T. J. Moore in 1871, gave the following particulars:—

1. Lemur. Madagascar.
2. Lemur. Madagascar.
3. Eland Antelope or Impoofo (female). *Oreas canna*. South Africa. (See 'Knowsley Menagerie,' pp. 27, 29, 30,

plates 26, 27; and Cornwallis Harris's 'Game and Wild Animals of Southern Africa,' p. 24.)

4. Nylghau (male, female, and young). *Portax tragocamelus.* India. ('Knowsley Menagerie,' pp. 28, 29, pl. 29, young.)
5. Bonte-bok (male, female, and young). *Damalis pygarga.* South Africa. ('Knowsley Menagerie,' p. 21, pl. 22. figs. 2, 3, and pl. 20. fig. 3, young; and Harris's 'Game and Wild Animals of South Africa,' p. 88.)
6. Bless-bok. *Damalis albifrons.* South Africa. ('Knowsley Menagerie,' p. 22, pl. 22. fig. 1; and Harris, p. 110.)
7. Wapiti Deer (stag, hind, and fawn). *Cervus canadensis.* North America. ('Knowsley Menagerie,' p. 58, pl. 36.)
8. Gerbille. *Gerbillus.* North Africa.
9. Chinchilla. *Chinchilla lanigera.* Chili and Peru.
10. Long-winged Caraca Eagle. *Milvago megalopterus.* Bolivia and Peru.
11. Hornbill. *Buceros (nasutus?).* W. Africa.
12. "Brush-Turkey" or Talegalla. *Talegalla lathami.* Australia.
13. Impeyan Pheasant (male and female). *Lophophorus impeyanus.* Himalayas.
14. Fire-back Pheasant (male). *Gallophasis vieilloti.*
15. Japan Pheasant. *Phasianus versicolor.* Japan.
16. The same, crossed with the Common Pheasant, *Phasianus colchicus.*
17. Californian Quail (male). *Callipepla californica.* California.
18. Goliath Heron. *Ardea goliath.* West Africa.
19. "Mountain Goose." "*Tadorna cana.*" South Africa?
20. Black-backed Goose (male and female). *Sarkidiornis africana.* West Africa.
21. Dusky Duck. *Anas obscura.* North America.
22. Yellow-billed Duck or "Guil-bec." *Anas xanthorhyncha.* South Africa.

Specimens of all the above, except no. 10, and perhaps nos. 1, 2, were living at Knowsley at the breaking up of the Collection in 1851, and these sketches were doubtless made *from those* specimens, either before or after their removal.—T. J. Moore, April 28, 1871.

The second volume, which was lettered on the back 'Knowsley Menagerie. Original Drawings by W. Hawkins and Wolf' (size 25 in. by 20 in.), contained sixty-nine original drawings by those artists. There was no manuscript list attached to this volume, but Mr. Sclater had prepared the subjoined account of its contents.

[In the following list the writing on each plate in ink and pencil is first given. The paragraphs added, enclosed in brackets, are Mr. Sclater's remarks.]

1. "*Anoa depressicornis.* Drawn from the living animal at Knowsley, Jan. 12, 1846, by Waterhouse Hawkins. Obtained

from the Jardin des Plantes à Paris in exchange, but lived a very short time."

[This is *Anoa depressicornis*, apparently adult male.]

2. "Figured from the living animals at Knowsley, Oct. 1847, by B. Waterhouse Hawkins. ♂ and ♀."

[This is the Bontebok, *Damaliscus pygargus*, ♂ ♀. These are the originals of the two right-hand figures in the 'Gleanings,' plate xxii.]

3. "*Gazella albifrons* or female Blesbok. Figured from the living animal at Knowsley, Sept. 25, 1847, by B. W. Hawkins."

[This is the original of the left-hand figure in the 'Gleanings,' plate xxii.]

4. "*A. corrigum*, ♀ and young (taken by Mr. Whitfield himself from the adjoining mother's womb), and *A. bubalis*, adult male."

[The left-hand figure is the Korrigum, *Damaliscus korrigum*; the right-hand is either *Bubalis buselaphus* or possibly *B. major*, as it shows blackish feet and whitish marks round the eyes.]

5. "Young and adult female Dacris, so called by Whitfield, but the last doubtful, supposed to be *Ant. equina*."

"I have compared this with the Cape specimen of *A. equina*, measured the ears, and can see no difference. I think it would be well to engrave this for the 'Gleanings.'—*J. E. Gray*."

[These are the young and adult female of the Equine Antelope, *Hippotragus equinus*, or of its representative species in West Africa.]

6. "Drawn from sketches made from the living animal on board the 'African,' Sept. 11th, 1848, by B. Waterhouse Hawkins."

[Two figures, side and front views of the head, apparently of the same young male *Hippotragus* that was figured in the last plate.]

7. "Young female Dacris. From sketches made from the living animal, Sept. 11th and 12th, 1848, by B. Waterhouse Hawkins."

[Two whole figures, apparently of the same animal as that represented in the last plate.]

8. "B. Waterhouse Hawkins at Knowsley, July 8th, 1843. Whitfield says the hair on the hip is slightly curled."

[Male, female, and young Kob, *Cobus kob*.]

9. "*A. bubalis*, jun."

[Apparently *Bubalis buselaphus*, jr.]

10. "Drawn from the living animals at Knowsley by B. Waterhouse Hawkins, Dec. 30, 1843."

[Male and female Eland, *Oreas canna*, apparently originals of plate xxvi. of the 'Gleanings.']

11. "Drawn from the living animals at Knowsley, April 3rd, 1845, by B. Waterhouse Hawkins."

[Three figures, apparently female, young, and half-grown male of Eland, *Oreas canna*, original of plate xxvii. of 'Gleanings.']

12. "Harnessed Antelope, *Antilope scripta*. Knowsley, June 30th, 1843. B. Waterhouse Hawkins."

[Harnessed Antelope, *Tragelaphus scriptus*, ♂ ♀. Original of plate xxviii. of 'Gleanings.']

13. "Coquitoun. Village of Waterloo, Sierra Leone. H. Whitfield.

"*Cephalophus*, female. ?if of the Grimm."

[Apparently *Cephalophus rufilatus*, see 'Book of Antelopes,' vol. i. p. 169.]

14. "From the living animals at Knowsley, March 20th, 1845, by B. Waterhouse Hawkins."

[Male, female, and young of Addax Antelope, *Addax nasomaculatus*. Plate xviii. of the 'Gleanings' is partly taken from this plate.]

15. "Drawn from the living animal at Knowsley, April 3rd, 1846, by B. Waterhouse Hawkins."

[*Addax nasomaculatus*, a side-figure.]

16. "Gazelle, what species? *We* have called it here *G. vera* or True Gazelle."

[Three figures apparently of the Arabian Gazelle, *Gazella arabica*, the originals of 'Gleanings,' plate iii.]

17. "Male Gibari or Mahomet's Antilope. Drawn from the living animal at Knowsley, Nov. 14th, 1845, by B. Waterhouse Hawkins. Thought very good."

[Male Gambian Oribi, *Ourebia nigricaudata* (see Bk. of Ant. vol. ii. p. 23, pl. xxvi.); probably original of plate v. of the 'Gleanings,' but the figure there given is reversed.]

18. "Figured from the living animal at Knowsley by B. W. Hawkins, Nov. 5, 1847.

"Hair pale yellowish, tip black."

[Probably male Crowned Duiker, *Cephalophus coronatus*. See Bk. of Ant. vol. i. p. 195, pl. xxii. fig. 2.]

19. "Figured from the living animals at Knowsley, Nov. 5th, 1847, by B. W. Hawkins.

"Hair root-grey, middle black, tip chestnut."

[Male and female Duiker, *Cephalophus* sp. inc.]

20. "From the living animals at Knowsley, March 14th, 1844, by B. Waterhouse Hawkins.

"Persian Deer received from Zoological Society in 1844. Taken in their winter dress. The stag still living, 1846, but hind died soon."

[Persian Deer, *Cervus maral*, ♂ and ♀.]

21. "Drawn from the living animal at Knowsley, Sept. 13th, 1844, by B. Waterhouse Hawkins.

"Persian Deer in his summer coat."

[*Cervus maral*, male; apparently original of plate xxxix. of the 'Gleanings.']

22. "*Cervus*, Himalayan Deer, received from Mr. McClelland, of Calcutta; reached us stone-blind, and still continues. Waterhouse Hawkins, drawn from the living animal at Knowsley, Sept. 6, 1847."

[*Cervus duvauceli*, male; apparently original of plate xl. of the 'Gleanings.']

23. "Wapiti Deer, stag and two hinds, in the distance a younger stag and pair of calves of last year. Drawn from the living animals at Knowsley by B. Waterhouse Hawkins, Jan. 26, 1844. Very good."

[Male, female, and young Wapiti Deer, *Cervus canadensis*; apparently original of plate xxxvi. of 'Gleanings.']

24. "Drawn from the living animal at Knowsley, Dec. 20, 1844, by B. Waterhouse Hawkins.

"Received from the Himalayas, 1842, but species not known."

[Apparently young male of *Cervus duvauceli*, and original of plate xli. of 'Gleanings.']

25. "Figured from the living animals at Knowsley, Sept. 20th, 1847, by B. Waterhouse Hawkins.

"Received from Mr. Westerman."

[Three figures, male and two females, of a *Cervus*, apparently the Javan Deer, *Cervus rusa*. Originals of plate xliii. of 'Gleanings.']

26. "Barbary Deer, stag, hind, and female calf of same year. Drawn from the living animals at Knowsley, Feb. 6th, 1844, by B. Waterhouse Hawkins. Very good."

[*Cervus barbarus*, male, female, and young. Original of plate xxxvii. of the 'Gleanings.']

27. "The female *C. equinus* and the male a Rusa, obtained from Amsterdam in 1845, but lived only a few months.

"Drawn from the living animals at Knowsley by B. Waterhouse Hawkins, Nov. 25, 1845."

[The male and female of two species of Rusine Deer, *Cervus* sp. inc.]

28. "Drawn from the living animals at Knowsley by Waterhouse Hawkins, Jan. 1844."

[Three figures, male and female in two positions, of the Virginian Deer, *Cariacus virginianus*, or of a nearly allied species. Original of plate xlvi. of the 'Gleanings.']

29. "Drawn from the living animals at Knowsley, July 1845, by B. Waterhouse Hawkins.

"See same animals figured March 22nd, 1844."

[Two figures, male and female, of an American Deer, probably *Cariacus leucurus* in summer dress. Original of plate xliv. of the 'Gleanings.']

30. "From the living animals at Knowsley, *winter colour*, March 22nd 1844, by B. Waterhouse Hawkins.

"? What species, refer Introduction Book; was it first considered by us the Black-tailed kind.

"See same animals figured July 1845."

[Two of same animals as figured in plate 29, probably *Cariacus leucurus* in winter dress. Original of plate xlv. of 'Gleanings.']

31. "Drawn from the dried skin of a very young specimen of *one* of the Brockets, but proposed to be set aside."

[Female of a Brocket, *Cariacus* sp. inc.]

32. "*Coassus rufus*, F. Cuv., male. Original of plate xlviii. in the 'Gleanings.' From Brazil.

"Drawn from the living animal at Knowsley, March 21st, 1846, by B. Waterhouse Hawkins."

[Red Brocket, *Cariacus rufus*, male, apparently original of right-hand figure of plate xlviii. of 'Gleanings.']

33. "Peta? Brockets. Drawn from the living animals at Knowsley, Feb. 6th, 1845, by B. Waterhouse Hawkins."

[Apparently mother and two young of a South-American Brocket, *Cariacus* (subgen. *Coassus*) sp. inc.]

34. "No. 1, *Coassus superciliaris*, female. Original of a plate of the 'Gleanings.' Habitat, South America. No. 2, male; 3, female, *Coassus rufus*, F. Cuv., pl. xlvii. of 'Gleanings.'

"Drawn from the living animals at Knowsley by B. Waterhouse Hawkins, Sept. 16th, 1847."

[Three figures, right and left male and female probably of *Cariacus rufus*, originals of plate xlvii. of 'Gleanings.' The centre figure, female Brocket, *Cariacus* sp. inc., seems to be the original of the right-hand figure of a plate in the 'Gleanings' called Eye-browed Brocket, *Coassus superciliaris*, without any number.]

35. "Water Musk from W. Africa. B. Waterhouse Hawkins, drawn from a dried skin at Knowsley, Nov. 9th, 1843."

[Male, female, and young of African Water Chevrotain, *Hyomoschus aquaticus*. Original of plate xxxi. of 'Gleanings.']

36. "Drawn from the living animals at Knowsley, August 1845, by B. Waterhouse Hawkins."

[Male, female, and young of Javan Chevrotain, *Tragulus javanicus*. Original of plate xxxv. of 'Gleanings.']

37. "Drawn from the living animal at Knowsley, Dec. 31st, 1844, by B. Waterhouse Hawkins. Nat. size ♀."

[Female of Stanley Chevrotain, *Tragulus stanleyanus*. Original of plate xxxiii. of 'Gleanings.']

38. "Alpaca. Drawn from the living animals at Knowsley, July 23rd, 1844, by B. Waterhouse Hawkins."

[Group of Alpacas, *Auchenia pacos*, six figures. Original of plate lii. of 'Gleanings.']

39. "Llama. Drawn from the living animals at Knowsley, July 9th, 1844, by B. Waterhouse Hawkins."

[Group of Llamas, *Auchenia glama*, five figures. Original of plate li. of 'Gleanings.']

40. "Vicuna. From the living animal at Knowsley, October 26, 1844, by B. Waterhouse Hawkins."

[Male and female Vicuna, *Auchenia vicugna*. See plate xlix. of 'Gleanings.']

41. "Drawn from the living animals at Knowsley, September 1845, by B. Waterhouse Hawkins."

[A pair of Onagers, *Equus onager*, apparently of the Indian form. See pl. liii. of 'Gleanings.']

42. "Drawn from the living animals at Knowsley, June 13, 1844, by B. Waterhouse Hawkins. The foal born at Knowsley, May 23, 1844.

"Male and foal still living, 1846."

[Male, female, and foal of the Mountain Zebra, *Equus montanus*. Original of plate lvi. of 'Gleanings.']

43. "Colobus. From a dried skin marked Whitfield 8.1.43 by B. Waterhouse Hawkins at Knowsley Hall, Nov. 22nd, 1843."

[Apparently *Colobus polycomus*.]

44. "Drawn from the living animals at Knowsley, October 1845, by B. Waterhouse Hawkins."

[A pair of Cheetahs, *Cynælurus jubatus*.]

45. "Drawn from the living animals at Knowsley, October 4th, 1845, by B. Waterhouse Hawkins."

[A pair of young Servals or of an allied species, possibly *Felis servalina*.]

46. "B. Waterhouse Hawkins, 1847."

[A Long-eared Fox, *Otocyon megalotis*.]

47. "B. W. H., Oct. 20, 1843. The specimen in Museum marked Bates, Belize river."

[Derbian Opossum, *Didelphys lanigera*. This is no doubt taken from the type of *D. derbiana*, Waterhouse, which was described from Lord Derby's specimen: see Waterhouse, Nat. Hist. Mammals, i. p. 495.]

48. "Adult female (now lost), young still living. From the living animal at Knowsley, April 22nd, 1845, by B. Waterhouse Hawkins."

[Two figures, mother and young, of the Philander Opossum, *Didelphys philander*.]

49. "Drawn from the living animals at Knowsley, Jan. 16th, 1845, by B. Waterhouse Hawkins."

[Three figures of the Patagonian Cavy, *Dolichotis patagonica*.]

50. "Drawn from the living animal at Knowsley by B. Waterhouse Hawkins, June 13th, 1845."

[A Cavy, probably the Rock Cavy, *Cavia rupestris*.]

51. "In Museum at Knowsley, figured by B. Waterhouse Hawkins, Oct. 10th, 1843. Specimen in Museum marked

J. Bates, Guitanala, Sept. 1843. Compare it with *S. griseo-caudatus* figured Mamm. Voyage 'Sulphur.'"

[Squirrel, one of the forms of *Sciurus hypopyrrhus*. See 'Biologia Centrali-Americana,' p. 128.]

52. "B. W. Hawkins. Specimen in Museum marked Whitfield, Sept."

[Le Conte's Squirrel, *Sciurus lemniscatus*: see Jentink, 'Notes from Leyden Museum,' iv. p. 36.]

53. "*Ctenodactylus massonii*, Gray, or Gundi of Tunis. H. C. Richter, del."

[Two figures of the Gundi Rat of Algeria, *Ctenodactylus gundi* (Gmelin).]

54. "J. Wolf, Oct. 28th, 1850."

[Group of Sambur Deer, probably *Cervus hippelaphus*.]

55. "J. Wolf, Oct. 7th, 1850."

[Group, apparently of Barasingha Deer, *Cervus duvauceli*, in summer pelage.]

56. "J. Wolf. Oct. 24th, 1850."

[Pair of albino Sambur Deer, *Cervus hippelaphus*?, in park at Knowsley.]

57. "J. Wolf, Oct. 19th, 1850."

[Male and female, with distant figures in the background of one of the South-American Deer, *Cariacus* sp. inc. On the back is written, in pencil, "Savanna Deer of Demerara and Guiana."]

58. "J. Wolf, Nov. 9th, 1850."

[Group of one of the Rusine Deer, perhaps *Cervus equinus*.]

59. "J. Wolf, Oct. 17th, 1850."

[Group of American Deer, probably *Cariacus virginianus* or *C. leucurus*, on snow.]

60. *Cephalophus rufilatus*, Gray, W. Africa. J. Wolf, August 16th, 1850.

[Group of the Red-flanked Duiker, *Cephalophus rufilatus*. See Bk. of Ant. vol. i. p. 167, pl. xix. fig. 1.]

61. "J. Wolf, August 1850. *Antilope quadricornis*."

[Group of Four-horned Antelopes, *Tetraceros quadricornis*. See Bk. of Ant. vol. i. p. 215, pl. xxiv.]

62. "J. Wolf, Oct. 14th, 1850."

[Adult and young males of Moose or Elk, *Alces machlis*, in deep snow.]

63. "J. Wolf."

[Hybrid Bull, see P. Z. S. 1849, p. 172; where the figure is copied and the animal is described by D. W. Mitchell.]

64. "J. Wolf, September 5th, 1850. Yak, female. *Bos grunniens*, from East India."

[Group of Yaks, *Poephagus grunniens*.]

65. "J. Wolf, Sept. 2nd, 1850. ½-bred between Brahmin Bull and cow, at Fain."

[Hybrid cattle.]

66. "J. Wolf, Oct. 11th, 1850.
Squirrel sent from Valparaiso."

[Squirrel, *Sciurus*, one of the forms of *S. hypopyrrhus*, probably *S. h. dorsalis*.]

67. "J. Wolf, Oct. 4th, 1850.
"*Ryzæna capensis*."

[Two figures of the Suricate, *Suricata tetradactyla*.]

68. "J. Wolf, Aug. 8th, 1850."

[Group of Guans, probably *Penelope superciliaris*.]

69. "J. Wolf, 1850."

[A cock and two hens of Prince Albert's Curassow, *Crax alberti*.]

Mr. W. Bateson exhibited three common blue Antwerp Pigeons, lent by Mr. F. Doggett, of Cambridge, showing webbing between the toes. The amount of webbing differed in each case. All the birds were the offspring of a single pair which were absolutely normal. The following remarks gave the details of each case:—

I.—*Right foot.* Digits 2 and 3 united by a web extending nearly to end of 2nd phalanx of each toe. In digits 3 and 4 the web does not extend quite so far.

Left foot. Like right foot, but the edge of the web between digits 2 and 3, when the foot is extended, stretches more nearly in a straight line from digit to digit, instead of being curved to form a bay.

II.—*Right foot.* Digits 3 and 4 webbed like 2 and 3 in right foot of foregoing. Digits 2 and 3 not webbed at all.

Left foot. Like the right, but the web between digits 3 and 4 extends rather beyond 2nd phalanx and is continued up the side of the toes on to the terminal phalanx as a narrow flap of skin.

III.—Both feet have the three digits completely webbed together to the bases of the claws. Right foot has digits 3 and 4 united by a loose web, but digits 2 and 3 are closely webbed together, so that they can scarcely be moved independently. In the left foot all three digits are thus closely united and the foot has a somewhat deformed appearance. The bird can, however, sit on a perch without difficulty.

The hallux is normal in every case.

The web is pink, healthy-looking skin, with scaling on the dorsal surface near the digits.

The birds I. and III. belong to one nest, but II. belongs to a later nest. Mr. Doggett states that he had seen one or both birds with more or less webbing in four different pairs of young reared by the same parents. Figures showing the right foot of III. and the left

foot of II. appear, together with a descriptive note by Mr. Tegetmeier, in the 'Field,' 1896, vol. 88, p. 464.

Attention was called to the fact that it is *not* the same pair of digits which are the most webbed in all cases; for in both feet of II. the web was developed chiefly between digits 3 and 4, while in I. the greatest development was between digits 2 and 3.

Prof. Newton, F.R.S., sent for exhibition a mounted specimen of a rare bird from the Sandwich Islands, accompanied by the following remarks:—

I submit for exhibition the type specimen of *Heterorhynchus olivaceus*, Lafresnaye (Magasin de Zoologie, 1839, pl. x.; Revue Zoologique, 1840, p. 321), which has been entrusted to my care by the courtesy of the authorities of the Natural History Society of Boston, and the kindness of the Curator of its Museum, Professor Alpheus Hyatt.

Soon after the return, in the winter of 1888–9, of Mr. Scott B. Wilson from his first visit to the Sandwich Islands, he brought the collection of bird-skins he had there made to Cambridge that it might be worked out. I gladly gave him all the help I could, and my applications to that end for the loan of specimens were generously granted by the custodians of several museums. One of the specimens I was most anxious for Mr. Wilson to see was the type of Lafresnaye's species above mentioned. This was included in the lithographed catalogue of that ornithologist's collection (No. 5677 *bis*) and was presumably in the Museum at Boston; but all Prof. Hyatt's efforts to find it were vain. Consequently Mr. Wilson had to do the best he could without examining it, and, as may be seen in his paper "On three undescribed Species of the Genus *Hemignathus*" (Annals and Magazine of Natural History, ser. 6, iv. pp. 400–402), he followed the example already set him by Cassin (United States Exploring Expedition, Mamm. & Orn. pp. 179, 180), by Mr. Sclater (Ibis, 1879, p. 92), and by Dr. Sharpe (Cat. B. Brit. Mus. x. p. 4) in keeping Lafresnaye's bird distinct from the *Hemignathus lucidus* of Lichtenstein (Abhandl. k. Akad. Berlin, 1838, p. 451, tab. 5. figs. 2, 3).

Towards the end of last summer I received a letter from Prof. Hyatt, referring to our former correspondence and telling me that, "In looking over the collection this year, one of my assistants found the *Heterorhynchus olivaceus*, 5677 *bis*, Lafresnaye Catalogue. Remembering the fact that you had applied for it, and looking up the matter and consulting your communication, I thought it best to inform you that this specimen had reappeared. It was misplaced, and consequently could not be found at the time it was needed."

At my request Prof. Hyatt obtained leave to send this specimen to me, and before returning it to Boston it seems desirable to exhibit it at a meeting of the Zoological Society, as I believe that no adult male example of this extinct species has been before seen

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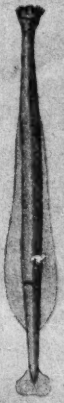
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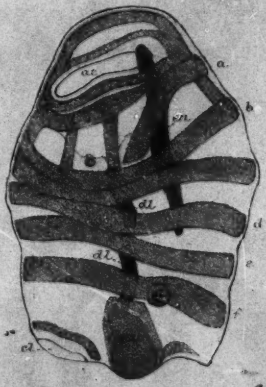

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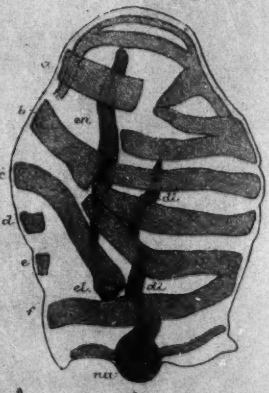

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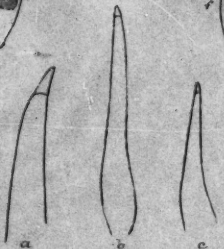

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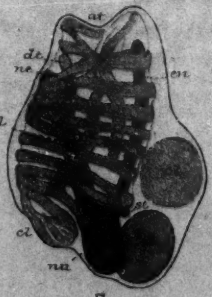

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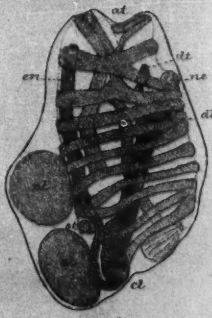

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G.H.F.del.
M.P.Parker lith.

West, Newman imp.

Plankton of the Faeroe Channel.

in this country, and Mr. Rothschild has stated (Avifauna of Laysan, p. 97) that Lafresnaye's type is in the Paris Museum. On this point he must have been misinformed, and the specimen he "carefully examined" there was probably one of the pair obtained and presented by Néboux (Revue Zoologique, 1840, p. 289), from which presumably the figures in the Voyage of the 'Vénus' (Ois. pl. i. figs. 1, 2) were taken. It is almost needless to remark that had the present example been attainable by Mr. Wilson he would never have supposed it to be specifically identical with the bird which he found in Hawaii; and I may observe that not one of the five examples of the *Hemignathus lucidus* of Oahu at his disposal—two from Berlin, two at Cambridge, and one in the British Museum—was that of a male in full plumage.

Mr. W. B. Tegetmeier, F.Z.S., exhibited an interesting application of the Röntgen rays to ornithology, in the shape of an actinograph taken from a Partridge that had "towered" on being shot. The actinograph seemed to show that the "towering" was caused by injury done to the lungs, and not by lesion of the brain, as often supposed.

The following papers were read:—

1. Contributions to our Knowledge of the Plankton of the Faeroe Channel.—No. I. By G. Herbert Fowler, B.A., Ph.D., Assistant Professor of Zoology, University College, London.

[Received November 3, 1896.]

(Plate L.)

Between July 29th and August 8th of this year I enjoyed the great advantage of a berth on H.M.S. 'Research,' by the permission of the Lords Commissioners of the Admiralty, extended to me at the request of the Council of the Royal Society. I am glad of this opportunity to tender my thanks, not only to both of these bodies, but also to Capt. Moore and the other officers of the 'Research' for placing at my disposal every facility that lay in their power.

My chief object on the cruise was an attempt to ascertain whether the intermediate zones of water between (say) 100 and 700 fathoms are characterized by definite forms of planktonic life or not; and if so, what temperature-limits form barriers to the distribution of various species. The large number both of surface and deep-water organisms obtained during the cruise will demand so long a study that it seems best to publish results as soon as obtained in the scant leisure of which a teaching post admits. The present note forms, therefore, the first of a series, in which

the methods employed and the general questions of distribution will be left to the last paper.

SAGITTA WHARTONI, sp. n.[1] (Plate L. figs. 1–3.)

In external form this species resembles most nearly *S. lyra* (Krohn), and differs from all other species yet described in the approximation, almost fusion, of the paired lateral fins. From Krohn's species, however, it is easily distinguished by the absence of a constriction between body and trunk and by the numbers of the teeth and cirrhi.

The head is large, 3–4 mm. wide and 2 mm. long in a specimen 45 mm. long. It bears on each side 8–10 stout cirrhi (Greifhaken), which are strongly curved, and of which the middle three are the longest. The accessory teeth (Nebenkiefer) are arranged in two series, of which the more dorsal are 3–5 in number and are short and stout; the more ventral are 5–7 in number and are slighter and longer. The neck is somewhat thinner than the body. The body tapers without constriction to the tail; the latter (post-septal region) is less than one-fourth of the total length. The lateral fins are set rather far back, the anterior being much longer and narrower than the posterior.

The longest specimen measured 45 mm. The following dimensions are taken from well-preserved straight specimens, of which A was apparently uncontracted, B contracted considerably antero-posteriorly:—

	A.	B.
Total length	30 mm.	38 mm.
Head, „	1	2
Body, „	23	26
Tail, „	6	10
Neck, width	1·5	3
Body, width at widest	2	4
Anterior fin, length	20	18
„ „ width	3	6
Posterior fin, length	10	7
„ „ width	4	9
Tail-fin, width	3	6

It is curious that this species should not have been taken by the Plankton Expedition, which records[2] *S. bipunctata* from the north of Scotland. From this it is distinguished readily by the approximation (continuity) of the lateral fins.

From *S. hexaptera* it is further distinguished by the size of the head, by the slightly more backward position of the posterior lateral fin, by the possession of more numerous cirrhi, and by the absence of the five-rayed star on the accessory teeth (*cf.* Strodtmann, *loc. cit.*).

[1] In honour of Admiral Wharton, R.N., the Hydrographer, a steady friend to oceanic research.

[2] Strodtmann, "Systematik der Chaetognathen," Arch. für Naturgeschichte, lviii. Band i. pp. 333–376, pl. xvii.

From *S. bipunctata* it is readily distinguished by the number of teeth in the accessory rows and the proportions of tail to body.

A row of stout processes is placed on the ventral side of the rows of accessory teeth. These appear to correspond to the "follicoli vestibolari" of Grassi; but in forming a single row they differ from those which he figures as characterizing *S. hexaptera*[1].

I have been unable to detect any trace of a "corona cigliata" (Riechorgan) on the dorsal surface of the head and neck.

This species[2] appears to be present in both the "cold" and the "warm" areas[3] of the Faeroe Channel, and to be a characteristic component of the "Mesoplankton," *i. e.* the floating and swimming organisms between a depth of $\pm$100 fathoms below the surface and a depth of $\pm$100 fathoms from the bottom.

Horizontal distribution: 61° 18′ N., 4° 21′ W., to 59° 42′ N., 7° 7′ W.

Vertical distribution:—

Greatest depth—warm area—Sta. 19 *a*, 480 to 350 fathoms; temp. 46° to 47° F.

Greatest depth—cold area—Sta. 13 *g*, 465 to 335 fathoms; temp. 31° to 33° F.

Least depth—Sta. 13 *i*, 100 to 0 fathoms; temp. 48° to 54° F.

The least depth given above was the only occasion on which it was taken anywhere near the surface, except for one doubtful and broken specimen at the surface at midnight (Sta. 15). There is no doubt that this species is essentially Mesoplanktonic, with a very wide temperature range (at least 33° to 48° F.); it occurred in every haul, but one, of those made between 530 and 100 fathoms (*i. e.* in eight out of nine hauls); it occurred in every haul which began at or lower than 300 fathoms and finished at the surface (three hauls); and was taken, certainly, only once in a haul which began at 100 fathoms and ended at the surface (once out of twenty-two hauls).

Spadella (Krohnia) hamata, Möbius. (Plate L. fig. 4.)

Having obtained a large number of well-preserved specimens of this species, I think it worth while to give an outline (fig. 4) of the external form, since both the original figure of Möbius[4] (which has been simply copied by Hertwig[5] and by Grassi[6]) and also the

[1] Grassi, *loc. cit. infrà*, pl. iii. fig. 6.

[2] I am anxious to leave the discussion of the bathymetric limits of the species taken on H.M.S. 'Research,' and of the means used to determine these limits, till the material has been more fully investigated. At the same time, in describing a new species it is necessary to provisionally indicate the depth at which it was taken; but remarks under this heading must be for the present considered as *provisional*, except in the case of surface forms.

[3] For an explanation of these areas, see Wyville Thomson, 'Depths of the Sea.' London, 1874. 8vo.

[4] Jahresb. Commiss. wissenschaft. Untersuch. deutschen Meere, Jahrg. ii., iii. p. 158, pl. iii. fig. 13.

[5] "Die Chaetognathen," Jenaische Zeitschrift, xiv. pl. ix. fig. 7.

[6] "I Chetognati," Fauna und Flora Golf. Neapel, v. pl. i. fig. 5.

more recent figure of Strodtmann [1], owing doubtless to ill-preserved material, are capable of improvement in respect of the lateral fins. There can be no doubt that the 'Research' specimens are referable to this species, since they agree with Möbius's description and figures of the cephalic armature to the minutest detail.

This species appears to be an essentially northern form. It was originally described by Möbius from the following localities:—N. of Hanstholmen, Korsfjord (twice), and N.W. of Skagen (misprinted S.W., *loc. cit.* p. 158) during the cruise of the 'Pommerania,' 1872.

It was recorded by Levinsen [2] from Greenland (Kronprinsens Eiland), from 30 m. W. of Cape Farewell, and from lat. 59° N., long.?; lat. 57° 50′ N., long. 48° 43′ W.; lat. 57° 48′ N., long. 43° 45′ W.

Strodtmann records it from the North Atlantic Drift ("Gulf-stream"), Irminger (Greenland) Sea, and the Labrador Current, *i. e.* from 60° to 50° N. latitude, as having failed in no single haul made by the 'National' (Plankton Expedition) in 1889.

In the Faeroe Channel it was rarely absent from a tow-net.

The deepest haul in which I obtained this species was in the warm area—Sta. 19 *a*, 480 to 350 fathoms; temperature 46° to 47° F. It may be regarded as having a fairly wide range of temperature (eurythermal), since it was obtained from the surface at a temperature of 53° F. (haul 15 *b*), and at a temperature of less than 33° F. (haul 13 *g*, 31° to 33° F.) in the cold area.

These four instances are, I believe, the only records of the occurrence of the species.

In illustration of the ease with which one may fail to collect specimens of a fairly plentiful species, may be cited two successive hauls, made within an hour of each other:

Haul 19 *a*, 480 to 350 fm., gave 6 specimens of *S. hamata*.
„ 19 *b*, 480 to 0 „ 0 „ „

In other words, 6 were caught in towing through 130 fm. of water, none in towing through 480 fm. (*cf.* Strodtmann, *loc. cit.* p. 367) with the same net at the same place.

SALPA ASYMMETRICA, sp. n. (Plate L. figs. 5–8.)

As was the case with most Salpæ collected on the 'Research,' the specimens of this species were considerably damaged by pressure against the tow-net, owing to the heavy rolling of the ship when hove to. Not all anatomical details could therefore be satisfactorily made out, but the following appear to be good characters:—

EXTERNAL CHARACTERS.—Body ovoid, flattened, devoid of processes. Apertures in *solitary form* terminal; apertures in *sexual*

[1] "Systematik der Chaetognathen," Arch. Naturgeschichte, lviii. Bd. i. pl. xvii. fig. 17.

[2] "Om nogle pelagiske Annulata," Vidensk. Selsk. Skriften, (6) iii. 321.

form, mouth dorsal, cloaca terminal. Surface smooth. Length of sexual form 12 mm.

Test clear, transparent, thin.

Mantle.—In the *sexual form* the musculature exhibits an asymmetry similar to that already described in *S. dolichosoma-virgula*, *musculosa-punctata*, and *magalhanica*[1]. The mouth has a pair of sphincters, apparently formed by splitting of two lateral longitudinal muscle-slips. At least one sphincter surrounds the cloacal aperture; but the arrangement of the musculature of both apertures was extremely difficult to make out, owing to the bad condition of the specimens. The order, or rather the disorder, of the main muscles is more easily appreciated from drawings than from a description (Plate L. figs. 5, 6, *a–f*). In addition to these there are two dorsal longitudinal muscle-slips, a dorsal sheet overlying the nucleus, and a fan-like sheet on the right of the nucleus.

In the *solitary form*, extracted with the placenta from the parent, the musculature is much more regular; it consists of eight complete bands, two large and (?) four small circumcloacal sphincters (the arrangement of which could not be exactly ascertained), a right and a left longitudinal slip of unequal length in connection with the two circumoral sphincters.

Endostyle fairly long and straight.

Dorsal lamina large (diam. in posterior third about 5 mm. in sexual form), with strongly-marked ridges. No languet was detected.

Dorsal tubercle large, about 5 mm. in length in sexual form; transversely marked with fine bands of cells.

Visceral mass comparatively small, brownish yellow in life.

At first it seemed probable that one was dealing merely with a specimen curiously broken, and that the asymmetry was artificial. But specimens of this species were taken on many occasions, and all possibility of the above explanation was destroyed when I obtained several specimens which presented the same asymmetry, but in a "Spiegelbild," namely the reversal which would be produced by a reflection in a mirror. The same reversal or "inverse image" has been discussed at length by Apstein[2] on the basis of the three asymmetrical genera cited above.

As the 'Ergebnisse der Plankton Expedition' are not readily accessible to everyone, and as the point is novel and of some interest, I quote Apstein's conclusions:—"Bei den übrigen Salpen, die eine symmetrische Muskulatur haben, ist Spiegelbild und Kongruenz dasselbe, bei einem unsymmetrischen Körper aber fallen Spiegelbild und Kongruenz nicht zusammen. Ich glaube jedoch, dass bei allen Salpen in der Kette die Individuen der eine Reihe gleich, d. h. kongruent sind, aber zu denen der anderer Reihe spiegelbildlich sich verhalten, aber dass dies in der Muskulatur

[1] Apstein, 'Ergebnisse der Plankton Expedition: Die Thaliacea.—B. Verteilung der Salpen,' p. 17.

[2] Apstein, *loc. cit.* p. 17.

meist nicht zu sehen ist, weil fast alle Salpenarten symmetrische Muskeln haben."

This adds an eighteenth species to the list of Salpæ occurring in the North Atlantic. It was obtained at two stations (four hauls) in small quantities: Sta. 13, 60° 2′ N., 5° 49′ W.; and Sta. 19, 59° 42′ N., 7° 7′ W. On these four hauls it was at the surface; in two more hauls at the same stations it was also taken from uncertain horizons with an open tow-net, probably at or near the surface.

EXPLANATION OF PLATE L.

Sagitta whartoni, sp. n. (p. 992).

Fig. 1. Ventral view. × 2.
Fig. 2. Dorsal view of head, showing some of the cirrhi, the two rows of accessory teeth, and the row of sensory processes. Cam. luc. × 12.
Fig. 3. Cephalic armature. *a*, end of cirrhus; *b*, tooth of ventral row; *c*, tooth of dorsal row. × 210.

Spadella (*Krohnia*) *hamata* (p. 993).

(Drawn by camera lucida.)

Fig. 4. Ventral view. × 2.

Salpa asymmetrica, sp. n. (p. 994).

a–f. main muscles of the mantle.
at. atriopore.
cl. cloaca.
dl. dorsal lamina.
dt. dorsal tubercle.
el. elæoblast.
en. endostyle.
ne. nerve-ganglion.
nu. nucleus.
pl. placenta.
st. stolon.

Fig. 5. Sexual form, dorsal aspect. × 4·5.
Fig. 6. Sexual form, ventral aspect. × 4·5.
Fig. 7. Solitary form, right side. × 16.
Fig. 8. Solitary form, left side. × 16.

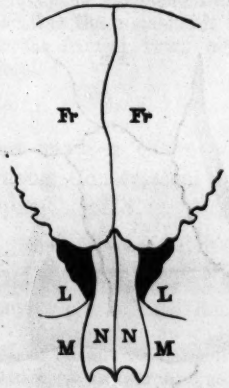
2. On the Occurrence of a Pair of Supernumerary Bones in the Skull of a Lemur and on a Peculiarity in the Skull of a young Orang. By ROBERT O. CUNNINGHAM, M.D., F.L.S., F.G.S., C.M.Z.S., Professor of Natural History, Queen's College, Belfast.

[Received November 9, 1896.]

A short time ago, when taking part in an oral examination on zoology at the Royal University of Ireland, Dublin, I was somewhat surprised to recognize in the skull of a common Lemur a small pair of supernumerary bones intervening between the frontals, nasals, and lachrymals. As I could not find any reference to such bones in any of the works on comparative anatomy at my disposal, I wrote to Sir William Flower, as our highest authority on the osteology of the Mammalia, to ask him if he could furnish me with any information on the point. He kindly handed my letter with its accompanying sketch to Dr. Forsyth Major, who showed him a skull with exactly the same bones, observing that

they were not uncommon in the genus *Lemur*, especially in young individuals, although their existence had apparently not been recorded. The bones in the specimen examined by me are triangular in form and, as will be realized from the sketch (fig. 1), occupy

Fig. 1.



Skull of Lemur, from above.

Fr. Frontals. x. Supernumerary bones. L. Lachrymals. N. Nasals. M. Maxillæ.

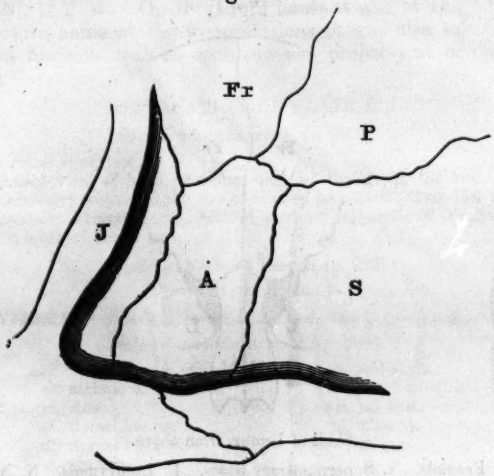
a position corresponding with the prefrontals in a Lizard or Crocodile. The suture which marks their limits is very clearly defined. It is interesting to note that corresponding bones have been recognized in the genus *Hippopotamus*. In a memoir[1] contributed to tome xvi., 1894, of the 'Annales des Sciences Naturelles' by MM. Grandidier and Filhol, for a reference to which I am indebted to Sir W. Flower and Dr. Forsyth Major, these bones are described and figured both in the case of an extinct species, *H. lemerlei*, from Madagascar and of young individuals of existing Hippopotami from Senegal. On examination of our only specimen of the skull of a Hippopotamus in the Museum of Queen's College, Belfast, I find the same bones (regarded by MM. Grandidier and Filhol as representing prefrontals) distinctly indicated, though the suture separating them posteriorly from the frontals is to a considerable extent obliterated.

In Sir W. Flower's admirable 'Introduction to the Osteology of the Mammalia' (3rd edition), the following statement occurs (p. 162) with respect to the squamosal in Monkeys: "The squamosal in the higher forms is developed much as in Man, but in the lower forms it is more reduced and takes a smaller share in the formation of the side-wall of the cranium. It generally comes in contact at

[1] "Ossements d'Hippopotames."

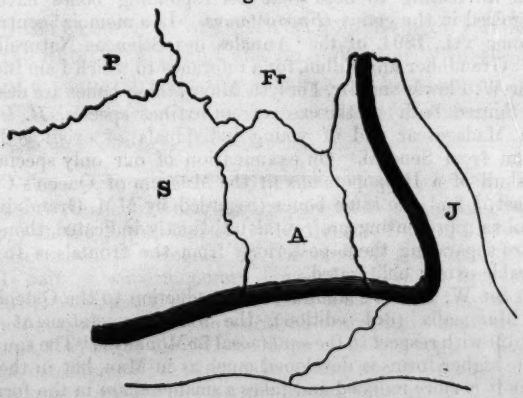
its upper anterior angle with the frontal, but not in the Orang or in the Cebidæ, in which animals the union of the parietal with the alisphenoid separates the frontal from the squamosal, as

Fig. 2 A.



Skull of Orang (left side).

Fig. 2 B.



Skull of Orang (right side).

P. Parietal. Fr Frontal. S, Squamosal. A. Alisphenoid. J. Jugal.

is usually the case with Man." That the latter is not invariably the case as regards the Orang is demonstrated by the skull of a young individual from Borneo, presented to me many years ago by my friend Captain J. W. Dixon, R.N., and now in the Museum of Queen's College, Belfast, of which I exhibit two drawings (figs. 2 A and 2 B). It will be observed that in this skull, though on the *left* side (fig. 2 A) the alisphenoid meets the parietal and frontal, thereby separating the squamosal, on the *right* (fig. 2 B) the squamosal meets the frontal, being interposed between the alisphenoid and parietal.

3. Description d'un nouveau Couroucou africain. Par le Dr. Alph. Dubois, Conservateur au Musée royal d'hist. nat. de Belgique, C.M.Z.S.

[Received December 1, 1896.]

Lorsqu' en 1886 je fis l'étude des oiseaux recueillis dans la région du lac Tanganyika par le Major Em. Storms, j'avais pris le Couroucou qui fait l'objet de cette notice pour un jeune *Hapaloderma narina*. Mais en faisant récemment une révision des *Trogonidæ* de notre Musée, je m'aperçus que l'un des quatre sujets rapportés du Tanganyika n'est pas un jeune *H. narina*, mais un mâle adulte d'une espèce distincte que je crois nouvelle, et dont voici la description :

HAPALODERMA RUFIVENTRE, sp. nov.

H. narinæ *affinis, sed pulchrior, et pectore, abdomine et subcaudalibus isabellino-rufis.*

Mâle.—D'un vert doré à reflets cuivrés ; joues nues[1] avec une bande étroite de plumes vertes dirigée obliquement d'avant en arrière ; grandes couvertures et rémiges secondaires noirâtres, vermiculées de blanc et bordées de vert cuivré ; rémiges primaires noires, blanches à la base ; les deux premières rectrices latérales blanches mais d'un vert noirâtre à la base, troisième rectrice d'un vert noirâtre, blanche à son extrémité, les médianes d'un vert olivâtre sombre mais bordées de vert brillant ; poitrine, abdomen et sous-caudales d'un roux-isabelle, plus pâle sur ces dernières ; tarses emplumés jusqu'aux doigts, ces plumes, de même que celles des jambes, sont d'un vert sombre varié de cendré. Bec jaune ; doigts roussâtres.

Long. tot. 280 millim., ailes 132 millim., queue 170, tarses 14.

Cet oiseau diffère donc de l'*H. narina* par le nu des joues plus étendu, et surtout par la coloration des parties inférieures, qui sont d'un roux isabelle sans la moindre trace de rouge.

Hab. Région du lac Tanganyika.

[1] Sur la peau préparée ces parties nues sont noirâtres ; il est donc probable qu'elles sont d'une teinte bleuâtre chez l'oiseau en vie.

4. On *Lysechinus*, a new Genus of Fossil Echinoderms from the Tyrolese Trias.

By J. W. GREGORY, D.Sc., F.G.S., Assistant in the British Museum (Nat. Hist.).

[Received October 22, 1896.]

(Plate LI.)

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II. Description of *Lysechinus incongruens*, gen. et sp. nov..... 1001
III. Affinities of *Lysechinus* and Classification of the Plesiocidaroida. 1001
IV. Affinities of the Plesiocidaroida 1003

I. *Introduction.*

The genus *Tiarechinus* was founded by Neumayr[1] in 1881 for a fossil from the St. Cassian Trias, which had been previously studied by Laube, whose name, however, had not been published. Neumayr described the fossil as an Echinoid having characters which allied it to the Archæocidaridæ, Cidaridæ, and Diadematidæ. He included it temporarily in the first-named family, but thought it would probably be necessary to institute for it a new order, intermediate between the Palæchinoidea and Euechinoidea. The main characters of the genus relied on by its founder were its large apical disc, short ambulacra, large mouth, and its having the granulation uniform, except for four small tubercles at the oral end of each interambulacrum. He thought that he could recognize certain sutures by the use of glycerine, but it was reserved for Loven[2] to prove that each interambulacrum consists of four plates, three vertical plates resting on a single oral plate. This discovery showed that *Tiarechinus* was even more abnormal than Neumayr thought. Duncan[3], in 1890, accordingly made it the type of a new order, the Plesiocidaroida, in which it has since been allowed to remain in solitary state. In the same year I found a specimen in the Klipstein Collection in the British Museum, which I at first regarded as a new species of *Tiarechinus*, an opinion which was shared by the late P. H. Carpenter, to whom I showed it; but a careful examination of the type specimen at Vienna, and of others there and in Berlin, showed that it was a distinct genus having the same type of structure.

[1] M. Neumayr, "Morphologische Studien über fossile Echinodermen," Sitz. k. Akad. Wiss. Wien, Bd. lxxxiv. Abt. 1, 1881, pp. 169–176, pl. ii. fig. 4.

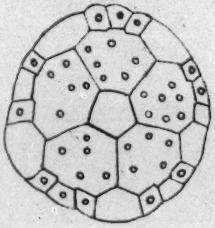
[2] S. Lovén, "On Pourtalesia," Handl. K. Svens. Vet.-Akad. Bd. xix. 1883, no. 7, pp. 12, 65, pl. xiii.

[3] P. M. Duncan. "A Revision of the Genera and Great Groups of the Echinoidea," Journ. Linn. Soc., Zool. vol. xxiii. 1890, p. 19.

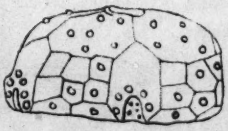
x 6/7 1a.

1b x 6/7

1c 6/7



2a



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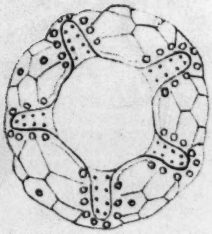

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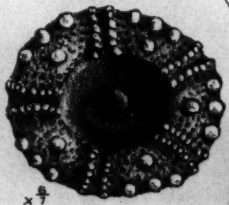

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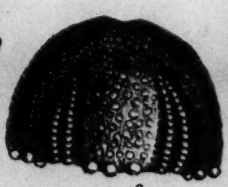

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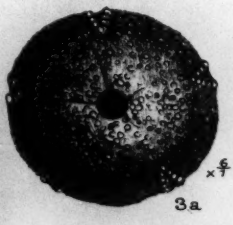

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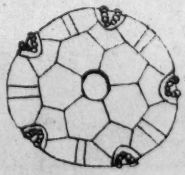

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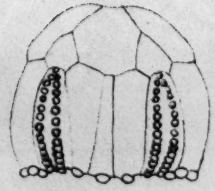

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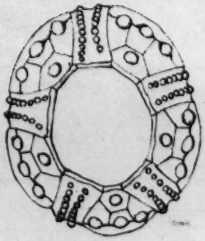

4c

E.Drake del. et lith. West, Newman imp.

Lysechinus & Tiarechinus.

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II. *Description of* Lysechinus.

Lysechinus [1], nov. gen.

Diagnosis.—Plesiocidaroida with the ambulacra limited to grooves on the oral half of the test.

Description.—*Test* small and slightly elliptic; margins tumid; oral and apical surfaces flattened.

Apical system very large, and forming most of the test. The basal ring consists of five plates, forming a closed ring. One (? more) of these is perforated by a pore. Their form is apparently heptagonal.

Ocular plates very large; they are hexagonal; five of the sides are straight, but the sixth is broken by a notch for the end of the ambulacrum.

Periproct large; an irregular pentagonal ellipse.

Ambulacra.—These occur in five (?) somewhat spoon-shaped depressions around the mouth. There are four or five small single pores on each side of each ambulacrum.

Interambulacra large. Apparently each consists of nine plates; there is a large single peristomal plate succeeded by two plates, above which are two series each of three plates.

The ornamentation consists of granules or small tubercles irregularly arranged. The spines are short, with a stout proximal knob.

Peristome very large, occupying nearly the whole of the lower surface of the test.

Dimensions.—Height	4	mm.
Diameter	7	„
Diameter of periproct	$1\frac{1}{2}$	„
„ „ peristome	$3\frac{1}{2}$	„

Distribution.—St. Cassian Schichten. Trias: St. Cassian, Tyrol.

Type Species [2].—*Lysechinus incongruens*, n. sp. Brit. Mus., E 3935.

III. *Affinities of* Lysechinus *and Classification of the* Plesiocidaroida.

The interpretation of the specimen on which this genus is founded is unquestionably difficult, owing to its small size, to the

[1] From λύσις, dissolution or disconnection. In Prof. Bell's 'Catalogue of British Echinoderms,' 1892, pp. 14, 24, the term lissactinic is used as a synonym of azygopodous. This is obviously a printer's error, λύσις having been mistaken for λισσός, smooth. The slip is here corrected at Prof. Bell's request; the word should be "lysactinic."

[2] There being only the one species it is impossible to say which of the characters are specific and which generic. No specific diagnosis is therefore possible.

close union of the plates having obscured the sutures, and to irregularity in the normal symmetry.

The small size of the specimen at once raises the question as to whether it is mature or is only a form so young that it is useless to found a genus upon it. If the specimen were the only echinid in the bed from which it came, or had been associated with echinids of normal size, it would probably have been impossible to give a satisfactory reply to this objection. But *Lysechinus* belongs to an echinid fauna all the members of which are minute. *Tiarechinus* is smaller, while the species of *Cidaris*, *Hypodiadema*, and *Salenia* are of about the same size. The specimens of the last three genera have the characters of maturity, in spite of their minuteness, and thus we cannot take the small size of *Lysechinus* as a proof that it is a larval form.

That it is not a pathological variation cannot be so definitely disproved. This idea seems supported by the fact that the radial symmetry of the specimen is not perfect. One of the interambulacra is more prominent than the rest, but this malformation is as likely to be a post-mortem accident during fossilization as an ante-mortem variation. But we cannot ignore *Lysechinus* as a mere sport until we know some echinid which may be regarded as the form of which it is the sport. Numerous echinids are known with some striking character which may be explained by teratology; but in such cases there is no doubt as to the species, or at least the genus, from which the sport arose. There is no known Triassic or Palæozoic echinid which resembles *Lysechinus* and *Tiarechinus*, and from which either genus can be conceived as having originated by a single variation. Several specimens of *Tiarechinus* are known, and they all agree in structure, so that that genus is not teratological; and until we know of some echinid from which *Lysechinus* could have sprung we cannot adopt the easy course of dismissing it as an abortion.

The greatest difficulty presented by the specimen is due to the close union of the plate, whereby the recognition of the sutures is difficult. By the aid of Lovén's fluid I believe that I can see sutures which show that each interambulacrum consists of nine plates, arranged as follows:—

1. Adjoining the genital plate are three quadrangular plates.
2. Three quadrangular plates, each bearing a tubercle.
3. Two angular plates, each bearing a tubercle.
4. One peristomal plate.

This arrangement is not altogether free from doubt, for it is difficult to discriminate between cracks and sutures, and they cannot be detected in all the areas [1].

[1] The sutures could probably be exposed by the application of weak acid but this method is not invariably successful, and so long as the specimen is unique it is not advisable to subject it to any risk.

The characters of *Lysechinus* which are unmistakable are the large mouth and apical system, and the small ambulacra occurring in grooves on the oral aspect of the test. These leave no doubt that *Lysechinus* is most nearly allied to *Tiarechinus*, and must be included as a second genus of Plesiocidaroida. It differs, however, from *Tiarechinus* in several important characters, of which the most remarkable are the limitation of the ambulacra to grooves on the oral half of the test, and the greater number of plates in the interambulacra. These differences are so important that it seems inadvisable to keep both genera in the same family, especially as neither genus appears to be on the direct line of descent of the other.

I therefore propose to classify the order as follows:—

ECHINOIDEA REGULARIA.

Order PLESIOCIDAROIDA.

DIAGNOSIS.—Echinoidea with a small rigid test; peristome and periproct central and opposite. Periproct in the centre of an apical system of large plates, which constitute half of the whole test. The ambulacral areas are short and biserial. The interambulacra begin with a single peristomal plate. There are no external gills.

Family 1. TIARECHINIDÆ.

DIAGNOSIS.—Plesiocidaroida with ambulacra with biserial pores. Each interambulacrum consists of four plates, viz., a single peristomal plate, and three tall vertical plates in a horizontal row.

Genus TIARECHINUS, Neumayr, 1881.

Species *Tiarechinus princeps*, Neumayr.

Family 2. LYSECHINIDÆ.

DIAGNOSIS.—Plesiocidaroida with ambulacra limited to grooves on lower surface of the test. Each interambulacrum begins with a single peristomal plate, succeeded by a row of two plates, and this by one or more containing three plates.

Genus LYSECHINUS, n. gen.

Species *Lysechinus incongruens*, n. sp.

IV. *Affinities of the* PLESIOCIDAROIDA.

After Loven's skilful analysis of the test of *Tiarechinus*, and discovery of the constitution of the apical area, the genus became of great importance in Echinoderm morphology. The theory that the apical plates of echinids and the central dorsal plates of stellerids were homologous with the plates that form the calyx of

the crinoids was then in the ascendency. The strikingly crinoid-aspect of the dorsal half of the test of *Tiarechinus* was held to support this theory by showing that the apical plates were of great functional importance in the primitive echinids.

The same line of argument would tend to connect *Lysechinus* with the Stellerida; for the ambulacra are "lysactinic," or limited to grooves on the oral surface, and the dorsal surface is somewhat like that of such an Ophiurid as *Ophiopyrgus*[1].

But in spite of the temptation to deduce the characters and affinities of the primitive echinid from these two genera, I am bound to confess that they appear to give no information whatever upon this subject. In the first place they came too late to be ancestral; they may be primitive, but they are not primæval. The Echinoidea began in the Ordovician. The Plesiocidaroida do not appear till the Trias. It is idle therefore to regard the Triassic caliculate *Tiarechinus* as the ancestor of the Silurian acaliculate *Echinocystis*. The Plesiocidaroida resemble the Mesozoic genera *Salenia* and *Acrosalenia* in the size of the apical area, and *Cidaris* in the arrangement of the ambulacral plates, rather than any of the Palæozoic families such as the Archæocidariidæ, Melonitidæ, or Palæechinidæ. When the order is compared with its predecessors its characters appear specialized instead of primitive, and it appears more reasonable to regard it as an aberrant offshoot from some Palæozoic echinid, rather than a close relation of the ancestor of the class.

This idea is quite in harmony with the evidence as to the physical conditions under which the members of the two genera lived. They both come from the Trias near St. Cassian. *Lysechinus* probably came from the neighbourhood of Sett Sass, and from the Middle St. Cassian or "Stuores zone." The rock-sequence of the Trias in this area[2] includes a variable series of volcanic tuffs, grits, and agglomerates, massive and nodular drusy dolomites, coral-reefs, and thin-bedded limestones. The sequence indicates considerable volcanic disturbances and very variable conditions; lagoons, no doubt, occurred among the coral-reefs, and if these became saline the animals in them would be stunted in development. Animal life was prolific in this warm sea, but the conditions were unfavourable to normal development. Hence the fossils—corals, sponges, echinids, and mollusca—are all small and stunted. The animals appear to have dwindled in size as the conditions became more and more adverse. As the echinids became smaller the tests appear to have needed strengthening, which was managed in two different ways. In the first the apical plates increased until they covered the whole upper half of the

[1] Th. Lyman, "Report on the Ophiuroidea," Rep. Chall. Exped., Zool. vol. v. 1882, p. 33, pl. ix. figs. 16, 17.

[2] See *e. g.* M. M. Ogilvie, "Contributions to the Geology of the Wengen and St. Cassian Strata in Southern Tyrol," Quart. Journ. Geol. Soc. vol. xlix. 1893, p. 22, and table facing p. 16.

test, as in the Plesiocidaroida. In the second case strength was obtained by the development of a plate in the centre of the apical system, as in the Saleniidæ, which first appear in the St. Cassian beds.

The last point it is necessary to consider is from what possible ancestor the Plesiocidaroida may have been derived. I am not aware that any suggestion has ever been made as to the ancestry of *Tiarechinus*. As Jackson remarks, in all echinids after *Bothriocidaris* there are only two plates in the second row of interambulacral plates, except in *Tiarechinus*, where there are three, an arrangement which is "therefore to be looked at as a feature standing quite by itself as a structural detail"[1]. *Lysechinus*, however, bridges the gap in this respect between *Tiarechinus* and the Palæozoic echinids. All those typical genera of the latter, in which none of the interambulacral plates pass on to the peristomal membrane, have the oral ends of the interambulacra arranged as in *Lysechinus*. In them a single peristomal plate is succeeded by two plates, above which occurs a line of three. *Lysechinus* is therefore the more primitive genus. The interambulacra of *Tiarechinus* can easily have been produced from it by the resorption of the second zone of interambulacral plates and increase in height of those of the third zone, so that they are left directly superposed on the single peristomal plate.

The St. Cassian fauna is rich in new types of structure, which probably arose from the somewhat wild attempts of its members to adapt themselves to unfavourable conditions of life. Hence it appears more reasonable to regard the Plesiocidaroida as a random offshoot rather than as an ancestral group, and as being of interest as a biological backwater out of the main stream of echinid development, instead of being its primary source.

EXPLANATION OF PLATE LI.

Fig. 1 *a*, *b*, & *c*. *Lysechinus incongruens*, from the Trias of St. Cassian. The test seen respectively from above, from below, and from the side. × 4 diam.
2 *a*, *b*, & *c*. The same in outline; diagrammatic.
3 *a*, *b*, & *c*. *Tiarechinus princeps*, seen from the same aspects. × 6 diam. (After Neumayr.)
4 *a*, *b*, & *c*. The same in outline; diagrammatic. (After Lovén.)
5. Diagram of an interambulacrum and genital plate of *Tiarechinus*.
6. „ of the same in *Lysechinus*.

[1] R. T. Jackson, "Studies of Palæechinoiden," Bull. Geol. Soc. Amer. vol. vii. 1896, p. 243.

5. On some new and little-known Spiders (*Araneidea*).

By the Rev. O. PICKARD CAMBRIDGE, M.A., F.R.S., &c.

[Received October 16, 1896.]

(Plate LII.)

The four Spiders described below are from widely separated localities—Ceylon, Borneo, and South America. For two of them (of the families *Myrmecidæ* and *Gasteracanthidæ*) it seems to me that two new genera are needed. Of the other two the females have already been described, but the males, now described and figured, are new. The Spider on which one of the new genera is based—*Friula* (*Gasteracanthidæ*)—is of exceptional interest; it was received by me many years ago from the collection of the late Mr. Wilson Saunders, with an almost illegible, and to me wholly unintelligible, little ticket attached to it, so that I neither knew the name of the captor nor the locality. Not long since I had an accidental clue to it which on being followed up resulted in these particulars being cleared up, and there is no doubt that this Spider was found at Sarawak by Dr. A. R. Wallace. It is with much pleasure that I have now conferred upon this singular form the name (so well known and valued by every biologist) of its captor.

Order ARANEIDEA.

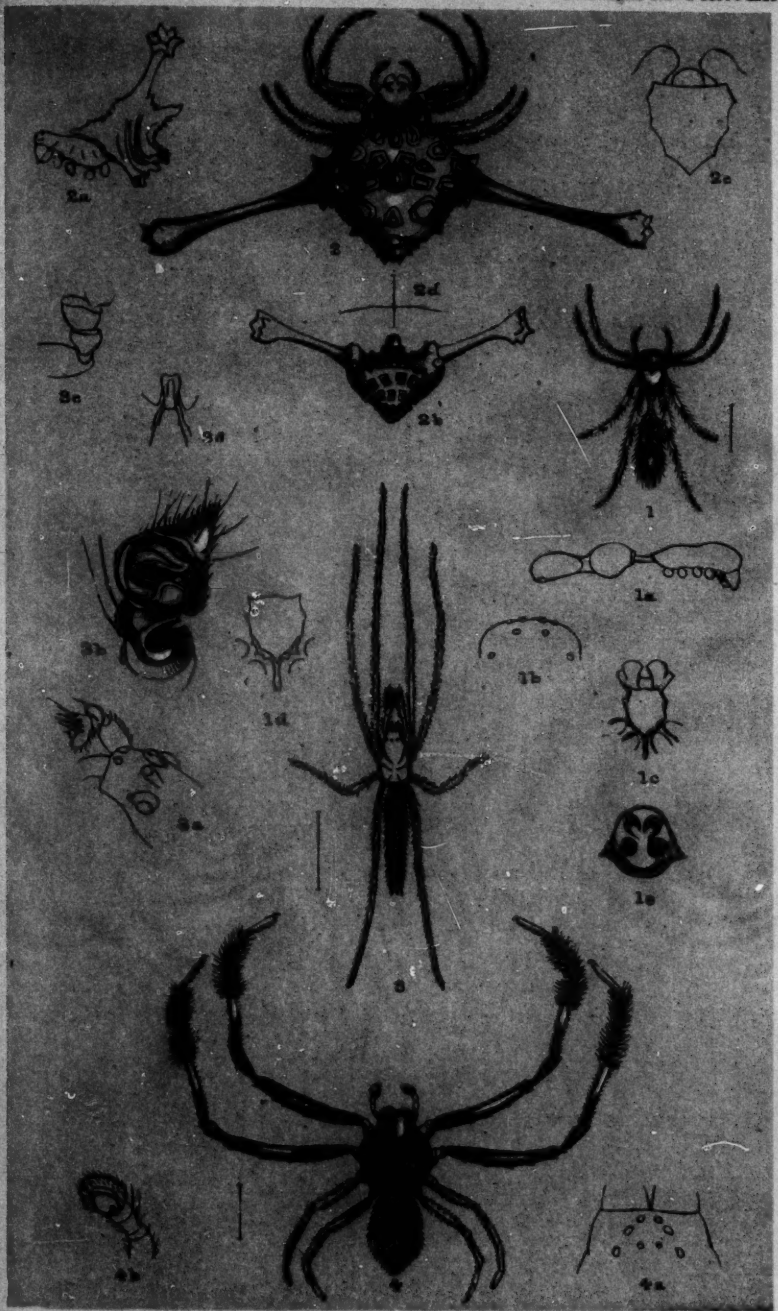
Gen. nov. AETIUS (fam. *Myrmecidæ*).

Cephalothorax much longer than broad; lateral marginal impressions at the caput slight; fore margin broadly but slightly roundly truncated. Posterior extremity rather drawn out into a somewhat tapering but truncated covering to the fore part of the connecting pedicle, which last is long, cylindrical, and corneous. Upper convexity moderate, profile slightly and uniformly curved; normal grooves and indentations very slight.

Eyes widely separated, in two transverse curved rows; the anterior row much the shortest and very slightly curved, the convexity of the curves of both rows directed forwards; the posterior row is double the length of the anterior and strongly curved. The four central eyes form a quadrangle broader than long, and its fore side shortest. The four laterals form a very large quadrangle whose relative proportions are similar to those of the central one, and the line formed by the laterals on each side is rather longer than that of the anterior row. The fore-central eyes are largest, the hind-laterals (apparently) the smallest.

Legs not very long; rather slender, not very unequal in size, 4, 2, 1, 3. Spines few and slender. Tarsal claws 2, with a small claw-tuft on a supernumerary or claw-joint.

Palpi short, slender; digital joints as long as, or a little longer



O.P.& F.O.P. Cambridge del. et lith. West, Newman imp

New or little known spiders.

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than, the radial and cubital together, enlarging or clavate at the fore extremity, which ends with a small untoothed claw.

Falces short, moderately strong, straight, subconical.

Maxillæ rather long, straight; broadest and rather roundly truncated at their extremity, and obliquely on the inner corners.

Labium broader than long; apex rounded.

Sternum longer than broad, its edges very strongly and distinctly emarginate, with prominent angular chitinous points running (when looked at from below) beneath the margin proper, to and between the bases of the coxæ of the third and fourth pairs of legs; a very narrow stripe, also of a similar chitinous kind, runs backwards between the posterior coxæ from the hinder point of the sternum.

Abdomen connected with the cephalothorax by a long cylindrical pedicle running into a strong circular socket, which forms part of a large coriaceous plate including the spiracular opening and enclosing the covering of the genital aperture. The abdomen is of an elongate or oblong-oval form, broadest and well rounded behind, and slightly constricted transversely at the middle; spinners very small, compact, and enclosed in a round sheath-like socket.

AETIUS DECOLLATUS, sp. n. (Plate LII. fig. 1.)

Adult female length 4 lines.

Cephalothorax black, with a short white pubescence on the sides of the thorax, and the greater part of the thorax bright yellowish red, leaving a broad, irregular, lateral black margin. The surface is covered thickly with small tuberculous granulosities.

Legs orange-yellow, the femora (excepting the anterior extremities, and a longish patch on the upperside of those of the fourth pair, which are reddish) being black, the genuæ and tibiæ of the fourth pair being also suffused with blackish. The femora are granulose. The spines beneath the tibiæ and metatarsi of the first and second pairs are in a longitudinal series of 3 pairs on the tibiæ and 2 pairs on the metatarsi.

Palpi yellow; the humeral joints suffused with blackish.

Falces similar in colour to the cephalothorax.

Maxillæ and *labium* deep brown, tipped with a paler hue.

Sternum dull orange-yellow.

Abdomen and connecting pedicle black. On either side of the fore extremity of the upperside is a short, curved, orange-red stripe, the convexity of the curves directed outwards; at the posterior extremity of each stripe is a patch of white pubescence, with a similar transverse stripe of pubescence across the middle and down the sides, and several small spots of the same behind it, in a central row to the spinners, just above which is a tuft of longish white hairs; the fore extremity also of the abdomen is clothed thinly with white pubescence, and there is a lateral slightly oblique stripe of the same halfway between the con-

striction and the spinners; immediately behind the constriction is a broad transverse band of somewhat iridescent greenish scales. The coriaceous plate connected with the sheath of the pedicle is mixed black and reddish, the sheath portion being covered with coarse granulations. The underside is deep black-brown.

Hab. Ceylon.

Gen. nov. FRIULA (fam. *Gasteracanthidæ*).

Cephalothorax as broad as long, upper surface rather flattened, profile forming a gradual, very slightly convex slope from the hinder extremity to the eyes. Caput broad, squarely truncate before. Height of clypeus about one-third that of the facial space. Normal grooves and indentations fairly marked, but not excessive.

Eyes small, not differing much in size; in the usual three Epeirid groups, forming a transverse straight line across the whole width of the fore extremity of the caput; each group seated on a strongish tubercular prominence. The central group of 4 eyes forms a square; those of each lateral pair are near together, but not contiguous.

Legs short, not very strong, subequal in length, apparently 4, 1, 2, 3, furnished with hairs only, the femora of the first and second pairs granulose.

Falces tolerably long and strong, conical, directed backwards.

Maxillæ and *labium*: these were difficult to be seen, owing to the specimen having been dried and pinned and the underparts concealed by the folding over of the legs, but they appear to be much like those of *Epeira*.

Sternum heart-shaped.

Abdomen diamond-shaped, the anterior angle truncated, and the exterior ones each prolonged into a long, strong, cylindrical, granulose lateral spine-like projection, directed rather backwards, and enlarged or clavate at the extremity, which ends in a group of six or seven small conical prominences. The length of each of these spiny projections exceeds the width of the abdomen. The whole surface of the abdomen is chitinous (like *Gasteracantha*), granulose, and marked with numerous sigilliform markings, in number and position as indicated in the figure; at the centre of the upperside is a round shiny boss-like prominence; and the margins of the abdomen are furnished with short tuberculiform spines or prominences, of which the longest and most spine-like are one on each side not far in front of the long lateral projections; between the hinder extremity of the upperside of the abdomen and the spinners are several strong transverse ridges, resembling diminishing repetitions of the upperside, the intermediate spines between that and the first ridge being marked, like the upperside, with sigilliform markings. The spinners are continued in a circular sheath about the middle of the underside.

FRIULA WALLACII, sp. n. (Plate LII. fig. 2.)

Adult female, length 3½ lines; length of abdomen 2⅝ lines; width of abdomen slightly less than the length; total width to extremity of the lateral projections very nearly 8 lines.

The whole of the Spider is of a dark rich reddish-yellow-brown colour, the sigilliform markings on the abdomen being a little darker than the rest. It is, however, quite possible that in life there might be other tints and colours now lost by age and desiccation.

Although an unmistakably Gasteracanthid Spider, it seems to me impossible to include this remarkable form in any genus as yet characterized.

Found by Dr. A. R. Wallace at Sarawak many years ago, and obtained from the collection of the late Mr. Wilson Saunders. It is only lately that I have been able to ascertain (from Dr. Wallace) that he was the captor of this Spider, and in the locality mentioned.

LABDACUS, Cambr.

LABDACUS MONASTOIDES, Cambr. (Plate LII. fig. 3.)

The female of this Spider (described and figured, P. Z. S. 1873, p. 118, pl. xii. fig. 3) was from Rio Grande, Brazil. The male now described resembles the female in general characters, colours, and markings. The length is 5½ lines, that of the abdomen being 3¾ lines.

Cephalothorax longer than broad, oval, truncated at each end; rather flattened above; profile-line to the posterior eyes level, excepting a slight depression at the thoracic junction; height of clypeus less than half the diameter of one of the fore-central eyes; lateral marginal impressions at the caput moderate. Colour brownish yellow, with a black marginal line and dusky converging bars.

Eyes greatly unequal in size, in three widely separated groups, on black tubercular eminences. The lateral pairs with the hind-central pair form a transverse curved line, whose convexity is directed forwards. The hind-lateral eye is the largest and seated on the outside of a strong hemispherical prominence, at nearly an eye's diameter from the fore-lateral, which is the smallest and placed in front of the same eminence; the hind-centrals are nearly, if not quite, as large as the hind-laterals, they are rather more than a diameter's distance apart. The four centrals form a quadrilateral figure, whose length is greater than its breadth, and its anterior side much the shortest.

Legs long, moderately strong, 1, 2, 4, 3; colour yellow; armed with spines, of which those beneath the tibiæ and metatarsi of the first and second pairs are long, strong, and placed in a longitudinal series of 8 or 9 pairs beneath the tibiæ, and 7 or 8 beneath the metatarsi; tarsal claws 3, springing from a small claw-joint.

The superior claws are strongly pectinate, the inferior sharply bent downwards.

The *palpi* are short, strong, similar in colour to the legs, furnished with spiny bristles, mostly at the fore part of the digital joint: the cubital and radial joints are very short; the latter rather the shortest, very prominent beneath, being produced there into a kind of apophysis from the whole underside of the joint, whose extremity is subdivided, its outer limb being the longest. The digital joint is of moderate size, rounded at its hinder extremity, and rather drawn out in a somewhat finger-like form before, and has a somewhat flat but round edged lobe at the base on the inner side. The palpal organs beneath the hinder part of the digital joint are prominent, complex, but tolerably compact.

Falces long, strong, straight, porrected, with several strongish teeth on each side of the groove of the fang.

Maxillæ long, strong, straight, rather broadest near the extremity, which is rounded on the outer and obliquely truncated on the inner side, with some strong, curved, prominent bristles along the outer sides.

Labium much longer than broad, at least two-thirds the length of the maxillæ. Apex slightly hollow-truncate.

Sternum somewhat elongate-oval; the anterior extremity is truncated but not broadly, and the posterior half has its sides straight, but converging to an angular point between the inner corners of the coxæ of the fourth pair of legs, which very nearly meet there.

Abdomen long, narrow, nearly cylindric, slightly tapering to the spinners, which are small and porrected. Colour dull luteous, with a small elongate fusiform marking at the middle of the fore part on the upperside, indicated by a dark marginal line and a prominent point on each side, whence it tapers to a point at the extremity; between the extremity of this marking and the spinners is a blackish somewhat angular spot, and along each are a few smaller dark spots.

Hab. Amazons, where it was taken by Prof. Traill, of Aberdeen, and included among many other Spiders kindly sent to me from that region.

Stephanopoides, Keyserling.

Stephanopoides brasiliana, Keys. (Plate LII. fig. 4.)

Count Keyserling, in 'Die Spinnen Amerikas,' Laterigradæ, 1880, p. 167, pl. iii. fig. 92, describes and figures the female only, from Brazil.

Adult male, length 3½ lines.

Cephalothorax as broad as long; lateral marginal indentations at the caput strong, sides of caput at the margin parallel, fore margin truncated, profile-line strongly curved, most convex at the occiput; surface smooth and polished, normal indentations slight; colour deep rich brown.

Eyes unequal in size; in two curved rows, the convexity of the curves directed forwards, the anterior row much shortest, but more strongly curved. The fore-laterals are largest; the hind-centrals perhaps slightly the smallest. The four central eyes form a quadrangle longer than broad, and its fore side slightly longer than the hinder one. The lateral pairs are seated on a strong geminated tubercular prominence, and the interval between those of each pair is equal to the diameter of the fore-lateral eye. The interval between the hind-centrals is equal to $1\frac{1}{2}$ diameters, and each is about 3 diameters from the hind-lateral on its side. The height of the clypeus is less than one-third that of the facial space.

Legs very unequal in length, 2–1, 4–3, those of the first and second pairs almost equal and much the longest; spines not numerous nor very long nor strong; the fore half of the tibiæ, as well as the metatarsi, of the first and second pairs are densely clothed with prominent black hairs, giving them a strongly tufted appearance. Colour of the first two pairs brown, paler than the cephalothorax, the tarsi and a central annulus on the tibiæ yellow; the third and fourth pairs also yellow; the tarsi end with numerous bristly hairs and a claw-tuft.

Falces moderately strong, conical, vertical, and similar in colour to the cephalothorax; at their extremity on the inner side they are densely furnished with strong hairs.

Palpi short, strong; cubital and radial joints short and of equal length, the latter broader at the fore extremity than at the base, but with no apophysis, its anterior side is furnished with spine-like bristles; the digital joint is of moderate size and regular oval form, pointed before, clothed with short strong hairs; the palpal organs are simple and not very prominent, consisting of a flattened round lobe surrounded by the almost double coil of a long black-brown tapering spine, beginning at the base and ending at the anterior extremity in a fine point.

Maxillæ long, strong, a little inclined to the labium, outer margin hollow, broadest at the extremity, where the outer side is obliquely truncated and the inner rounded.

Labium large, higher than wide, about two-thirds the height of the maxillæ, narrowing gradually to the apex, which is truncated and about half the width of the base; the sides of the labium are slightly convexly curved. The colour of the maxillæ and labium is yellow-brown.

The *sternum* is heart-shaped, yellow-brown, darker on the margins; it is slightly longer than broad, hollow, truncate at its fore extremity and obtusely truncate at its hinder part. The coxæ of the fourth pair of legs very nearly meet at their hinder extremity, which is rounded on the inner side.

Abdomen broadest towards the hinder part, where it is of a somewhat rounded angular form, truncated before, pointed behind, upperside somewhat flattened: it is of a luteous colour; on the centre of the upperside are four red-brown spots forming a quadrangle, whose length is greater than its breadth and its

anterior side shortest, the posterior spots are largest; the fore half is bounded by a broadish lateral band of cream-colour, and from the inner extremities of the band a curved narrow tapering stripe of the same hue runs inwards and backwards, but their points do not meet; following this towards the spinners is a curved transverse cream-coloured stripe, being only linear in the middle, close behind which again is a short curved transverse cream line connecting the bases of two triangular patches of the same hue; spinners short, compact, underside dusky, margined with a cream-coloured suffused border. Colulus short, triangular.

Received from Prof. Traill; taken on the Amazons.

EXPLANATION OF PLATE LII.

Fig. 1. *Aetius decollatus*, ♀ (p. 1007). 1*a*. Profile. 1*b*. Eyes from above and behind. 1*c*. Maxillæ, labium, and sternum. 1*d*. Sternum, showing more clearly posterior elongation and angular points. 1*e*. Genital aperture.

2. *Friula wallacii*, ♀ (p. 1009). 2*a*. Profile. 2*b*. Abdomen from behind. 2*c*. Maxillæ, labium, and sternum. 2*d*. Lines showing natural length and width of Spider.

3. *Labdacus monastoides*, ♂ (p. 1009). 3*a*. Eyes. 3*b*. Palpus. 3*c*. Portion of palpus. 3*d*. Labium and fore part of sternum.

4. *Stephanopoides brasiliana*, ♂ (p. 1010). 4*a*. Eyes from above and behind. 4*b*. Palpus.

6. On the Genera of Rodents: an Attempt to bring up to Date the current Arrangement of the Order. By Oldfield Thomas, F.Z.S.

[Received November 13, 1896.]

Just over twenty years ago, in 1876[1], Mr. E. R. Alston contributed to this Society his invaluable paper "On the Classification of the Order Glires," a paper which in its broad outlines has formed the basis for almost every Museum Catalogue, compiler's list, and general text-book that has been written since it appeared. Based as it was on the earlier works of Waterhouse, Gervais, Brandt, and Lilljeborg, Alston's arrangement has in this way received almost universal sanction, and the present writer is far from wishing to alter the essential characteristics of the scheme.

But, owing partly to Alston's not having seen examples of many of the genera included, and partly to the great increase in the number of known forms that has taken place since he wrote, his paper has gradually become somewhat obsolete in its detailed arrangement of the subfamilies and genera, however correct his positions for the suborders and families may still be considered to be.

[1] P. Z. S. 1876, p. 61.

Now, every Museum-curator when arranging his specimens, and every writer either of a text-book or of a faunistic work, is constantly being confronted by the difficulty as to where to place in the system this or that genus of Rodents, for which he has perhaps himself neither time, inclination, or opportunity to search out a proper and appropriate position. It is for the object of helping such persons that the present paper has been prepared, so bold a venture being due to the fact that the increase in the British Museum collections has fully kept pace with the general increase of knowledge, and that there are very few genera known from any part of the world of which specimens are not in that collection[1]. With such unrivalled material available, the opportunities for mistaken work have been reduced to a minimum; and in the following list it may be said that the specimens have been allowed to sort themselves, and where my alterations are found to be strikingly different from those of Alston it will generally be found that the forms referred to were not available for examination in his time[2].

One recent author only has diverged much from Alston's system, namely Dr. Winge of Copenhagen, who, in connection with his work[3] on the Rodents of Lagoa Santa in Brazil, has written a revised general arrangement of the Rodents. His classification, however, is a rather one-sided one, being based almost entirely on the structure of the masseter muscles and the bones related to them, and, however thoughtful and clever it may be in many ways, is so widely divergent from all previous classifications that without much stronger reasons than he adduces I should not be prepared to follow it. No doubt many of his alterations are admirable, such, for example, as the reference of *Sminthus* to the *Dipodidæ*; but when we find *Pedetes* placed with *Anomalurus*, and *Platacanthomys* combined with *Myoxus* in a group set over against *Graphiurus*, we see that a good deal of confirmation will be needed before the classification the world is accustomed to is abandoned in favour of that proposed by Dr. Winge. Prof. Zittel[4] and Dr. Tullberg[5] have also contributed to the revision of the classification of the Rodents. The former gets rid of the difficulties by putting all the awkward families into a separate group, the Protrogomorpha. The latter largely follows Winge, but does not as yet enter into details.

Dr. Trouessart's most useful list of Rodents is entirely based on Alston's arrangement, and is so admittedly a compilation that no special criticism of it is here necessary.

No attempt has been made to follow Alston's example of giving diagnoses of the groups and genera, partly for the simple reason

[1] Of the 159 genera now admitted, only the following 15 are not represented in the Museum collection: *Idiurus*, *Oreinomys*, *Deomys*, *Limacomys*, *Pithecochirus*, *Hallomys*, *Hypogeomys*, *Notiomys*, *Xenomys*, *Microdipodops*, *Euchoreutes*, *Massoutiera*, *Cercomys*, *Dinomys*, and *Romerolagus*.

[2] E. g., *Heterocephalus*, *Lophuromys*, *Steatomys*, *Saccostomus*, &c.

[3] Jordfundne og nulevende Gnavere fra Lagoa Santa, E Mus. Lundii, iii. 1887.

[4] Handb. Palæontol. p. 512 (1893).

[5] Muriden aus Kamerun (Nova Acta Soc. Upsala), sec. 3, xvi. p. 4 (1893).

that the labour and time demanded would have rendered the preparation of the paper at all quite impossible, and partly because such diagnoses can never be really full and accurate unless prepared in connection with the working out of the species of each genus. Moreover, of all the groups he recognizes, Alston's paper contains diagnoses, and it would be superfluous to repeat them here. Where I differ from his conclusions full reasons are given in the footnotes.

Comparing the numbers of recent families and genera recognized in the two papers, we have 18 families in Alston against 21 now, the difference being due to the *Lophiomyidæ* being suppressed, and the *Bathyergidæ*, *Heteromyidæ*, *Erethizontidæ*, and *Pedetidæ* added. Of genera Alston recognized 100, as against 159 now considered valid; of the additional 59 just about half are formed by the breaking up of old genera and half are altogether new discoveries.

Nomenclatural questions have of necessity cropped up here and there, and the recent work of American authors in this respect has been fully utilized. It is with the greatest regret that I have had to use a good many names unfamiliar to English naturalists, but the evidence in every case is so clear as to leave no room for doubt, and none are mere matters of opinion. Recognizing that the ultimate use of these names is inevitable, I think the sooner a knowledge of them is disseminated the sooner will the intermediate stage of confusion be passed through and done with. Where comparatively unfamiliar names are used, the better-known terms are placed in brackets after them, as also are any special synonyms which it seems of importance to mention.

It should be again repeated that the special object of the list is the proper allocation of the genera in their respective subfamilies, and I have purposely been as conservative as possible with regard to the groups of higher rank, following Alston wherever there has not been very special reason for departing from his arrangement.

In regard, however, to *Anomalurus* and *Aplodontia*, both placed by him in the Sciuromorpha, I have had to give in my adhesion to the views expressed by more recent authors, that these two aberrant genera cannot rightly be placed with the Squirrels. But where they should go is by no means clear—Winge, Zittel, and Tullberg all differing in the matter; nor can I say that I agree with any one of them. As it seems a pity to abolish the convenient and time-honoured groups Sciuromorpha, Myomorpha, and Hystricomorpha, just for the sake of these genera, I have thought it best to put each of them under a special group-name [1], leaving it for further research to show their true relationships. Fortunately, their serial position in the list, like that of *Pedetes*, may be left almost exactly as in Alston's paper.

[1] I have purposely not used names ending in *morpha*, as, apart from the length and clumsiness of the resulting combinations, I do not think it at present advisable to consider the groups Anomaluri and Aplodontiæ as of the same rank as the Sciuromorpha and the others.

Suborder I. **SIMPLICIDENTATI.**

A. ANOMALURI.

I. **Anomaluridæ.**

1. *Anomalurus*, Waterh.
P. Z. S. 1842, p. 124.
2. *Idiurus*, Matsch.
SB. Ges. nat. Berl. 1894, p. 194.

B. SCIUROMORPHA.

II. **Sciuridæ.**

A. SCIURINÆ.

(*a*) 3. *Rheithrosciurus*, Gray.
Ann. Mag. N. H. (3) xx. p. 271 (1867).
4. *Xerus*, H. & E.
Symb. Phys. i. *gg* (1832).
5. *Sciurus*, Linn.
S. N. (10) i. p. 63 (1758).
6. *Tamias*, Ill.
Prodr. Syst. Mamm. p. 83 (1811).
7. *Spermophilus*, F. Cuv.
Mém. du Mus. ix. p. 293 (1822).
8. *Cynomys*, Raf.
Am. Month. Mag. ii. 45 (1817).
9. *Arctomys*, Schr.
Säug. iv. p. 721 (1792).

(*b*) 10. *Eupetaurus*, Thos.
J. A. S. B. lvii. p. 256 (1888).
11. *Petaurista*, Link.
Beytr. Nat. ii. p. 78, (1795). Type "*Sciurus petaurista*." [*Pteromys*, G. Cuv. Léçons d'Anat. Comp. 1800.]
12. *Sciuropterus*, F. Cuv.
Ann. du Mus. x. p. 126 (1825).

B. NANNOSCIURINÆ[1].

13. *Nannosciurus*, Trouess.
Bull. Soc. Sci. Angers, 1880, p. 73.

III. **Castoridæ.**

14. *Castor*, Linn.
Syst. Nat. (10) i. p. 58 (1758).

C. APLODONTIÆ.

IV. **Aplodontiidæ.**

15. *Aplodontia*[2], Rich.
Zool. Journ. iv. p. 334 (1829).

[1] See Major, P. Z. S. 1893, p. 189.
[2] With regard to the insertion of the aspirate into the spelling of this and

D. MYOMORPHA.

V. Gliridæ.

A. Glirinæ.

16. *Glis*[1], Briss.
Règne Animal, p. 160 (1756). [*Myoxus*, Schr. Säug. iv. p. 824 (1792).]

17. *Muscardinus*, Kaup.
Entw. europ. Thierw. p. 139 (1829).

18. *Eliomys*, Wagn.
Abh. Ak. Münch. iii. p. 176 (1843). [*Bifa*, Latr. Le Nat. 1885.]

19. *Graphiurus*, F. Cuv. & Geoffr.
H. N. Mamm. (fol.) livr. 60 (1845).

B. Platacanthomyinæ[2].

20. *Platacanthomys*, Bly.
J. A. S. B. xxviii. p. 288 (1859).

21. *Typhlomys*, M.-Edw.
Bull. Soc. Philom. (6) xi. p. 9 (1877).

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similar words, inquiry among pure classicists (other than zoologists) elicits the opinion that the Latins were so careless and irregular themselves in this respect, that it is impossible to make a hard-and-fast rule about it, and that we should therefore accept the original aspiration or non-aspiration of scientific names. Personally I look with loathing on these *h*-less names, but I feel bound to recognize that it is not right to alter words formed by authors who Latinized their Greek in the very way that the Latins themselves sometimes did.

[1] See Merriam, 'Science,' 1895, p. 376.

[2] Dr. Winge has replaced *Platacanthomys* in the Gliridæ, from which it was removed to the Muridæ by Dr. Peters, and in this he has been followed by Dr. Tullberg; and I am informed by Dr. Forsyth Major, to whom I am indebted for much assistance in the preparation of the present paper, that he also holds the same view. On the whole, although I think there is enough evidence of Murine affinity in *Platacanthomys* and its ally *Typhlomys* to make the question rather doubtful, I am inclined to agree to the reference of these genera to the family Gliridæ, on account of the structure of their teeth and interorbital region, the peculiar glirine twisting of their mandibular angles, and of their (or at least the former's) want of a cæcum—a character found in the Gliridæ alone of the Rodents, and one which I am now able to record for the first time in *Platacanthomys*.

As to their position within the family, I venture to think that Winge's combination of them into *Glis*, *Eliomys*, and *Muscardinus*, in a group set over as a whole against *Graphiurus*, is quite astonishingly unnatural, and is evidently due to the exaggerated value he gives to his pet character of the anteorbital structures. The *Platacanthomyinæ* form by themselves a very natural subfamily, set over against the Dormice; while even among the latter it might be quite as correct to separate *Glis* and *Muscardinus* on the one side from *Eliomys* and *Graphiurus* on the other by the pattern of the teeth, as to separate the last-named from the rest by the structure of the anteorbital region. An interesting example of the occasional variability of the last-named character is given by *Blarinomys*, which, obviously a modified offshoot of *Acodon* and *Oxymycterus*, has an anteorbital region not at all unlike that of *Graphiurus*.

VI. Muridæ.

A. Hydromyinæ.

22. *Hydromys*, Geoff.
Ann. Mus. vi. p. 81 (1805).

23. *Xeromys*, Thos.
P. Z. S. 1889, p. 247.

24. *Chrotomys*, Thos.
Ann. Mag. N. H. (6) xvi. p. 161 (1895).

B. Rhynchomyinæ.

25. *Rhynchomys*, Thos.
Ann. Mag. N. H. (6) xvi. p. 160 (1895).

C. Phlœomyinæ.

26. *Phlœomys*, Waterh.
P. Z. S. 1839, p. 108.

D. Gerbillinæ.

27. *Gerbillus*, Desm.
N. Dict. d'H. N. (1) xxiv. Tabl. p. 22 (1804).

28. *Pachyuromys*, Lat.
Le Nat. i. p. 314 (1880).

29. *Meriones*, Ill.
Prodr. Syst. Mamm. p. 82 (1811).

30. *Psammomys*, Cretszchm.
Rüpp. Atlas nördl. Afr. i. p. 56 (1826).

31. *Rhombomys*, Wagn.
Schr. Säug. Supp. iii. p. 485 (1843).

E. Otomyinæ.

32. *Otomys*, F. Cuv.
Dents Mamm. p. 168 (1825).

33. *Oreinomys*, Trouess.
Bull. Soc. Sci. Angers, 1880, p. 111. [*Oreomys*, Heugl. Reise Nordost-Afr. ii. p. 76 (1877).][1]

F. Dendromyinæ[2].

34. *Deomys*, Thos.
P. Z. S. 1888, p. 130.

35. *Dendromys*, A. Sm.
S. Afr. Q. Journ. ii. p. 158 (1834).

[1] Very doubtfully distinct from *Otomys*.

[2] Three figures of molar teeth, representing those characteristic of the *Dendromyinæ*, *Murinæ*, and *Sigmodontinæ* respectively, will be found in my paper on *Deomys* (P. Z. S. 1888, p. 130, pl. v. figs. 7, 10, and 9). On that occasion, when describing *Deomys*, I had supposed the genus to form a new subfamily, not knowing how closely its molar teeth agreed with those of the *Dendromyinæ*, in which I now think it should be included.

36. *Limacomys*, Matsch.
SB. Ges. nat. Berl. 1893, p. 107.
37. *Steatomys*, Pet.
SB. Ak. Berl. 1846, p. 258.
38. *Malacothrix*, Wagn.
Schr. Säug. Supp. iii. p. 496 (1843).

G. Murinæ.

39. *Mus*, Linn.
S. N. (10) i. p. 59 (1758).
40. *Nesokia*, Gray.
Ann. Mag. N. H. x. p. 264 (1842).
41. *Cricetomys*, Waterh.
P. Z. S. 1840, p. 2.
42. *Malacomys*, M.-Edw.
Bull. Soc. Philom. (6) xi. p. 9 (1877).
43. *Lophuromys*, Pet.
MB. Ak. Berl. 1874, p. 234 (1875).
44. *Saccostomus*, Pet.
MB. Ak. Berl. 1846, p. 258 (1847).
45. *Acomys*, Is. Geoff.
Ann. Sci. Nat. (2) x. p. 126 (1840).
46. *Arvicanthis*, Less.
N. Tabl. R. A., Mamm. p. 147 (1842).
[*Isomys*, Sund. K. Vet.-Ak. Handl. Stockh. 1842, p. 219 (1843).]
47. *Golunda*, Gray.
Charlesw. Mag. N. H. i. p. 586 (1837).
[*Pelomys*, Peters, Reise Mossamb., Säug. p. 157 (1852).]
48. *Vandeleuria*, Gray.
Ann. Mag. N. H. x. p. 265 (1842).
49. *Chiropodomys*, Pet.
MB. Ak. Berl. 1868, p. 448 (1869).
50. *Batomys*, Thos.
Ann. Mag. N. H. (6) xvi. p. 162 (1895).
51. *Carpomys*, Thos.
Ann. Mag. N. H. (6) xvi. p. 161 (1895).
52. *Chiruromys*, Thos.
P. Z. S. 1888, p. 237.
53. *Hapalomys*, Blyth.
J. A. S. B. xxviii. p. 296 (1859).
54. *Pithecochirus*, F. Cuv. & Geoffr.
H. N. Mamm. (fol.) iv. livr. 66 (1833).
55. *Crateromys*, Thos.
Ann. Mag. N. H. (6) xvi. p. 163 (1895).
56. *Craurothrix*, Thos.
Ann. Mag. N. H. (6) xviii. p. 246 (1896).
[*Echiothrix*, Gray, P. Z. S. 1867, p. 599.]
57. *Mastacomys*, Thos.
Ann. Mag. N. H. (5) ix. p. 413 (1882).

58. *Uromys*, Peters.
MB. Ak. Berl. 1867, p. 343. [*Pogonomys*, M.-Edw.]

59. *Conilurus*, Og.
Tr. Linn. Soc. xviii. p. 125 (1839). [*Hapalotis*, Licht. Darst. Säug. pt. iv. pl. 29 (1829).]

H. LOPHIOMYINÆ.

60. *Lophiomys*[1], M.-Edw.
L'Inst. xxxv. p. 46 (1867).

I. SIGMODONTINÆ.

(*a*) (Palæarctic.)

61. *Hamster*, Lac.
Mém. de l'Inst. iii. p. 495 (1801). [*Cricetus*, G. Cuv. Règne Anim. i. p. 198 (1817).]

(*b*) (African.)

62. *Mystromys*, Wagn.
Arch. f. Nat. 1841, p. 132.

(*c*) (Mascarene.)

63. *Brachytarsomys*, Günth.
P. Z. S. 1875, p. 79.

64. *Nesomys*, Pet.
SB. Ges. nat. Berl. 1870, p. 54 (1871).

65. *Hallomys*, Jent.
Notes Leyd. Mus. i. p. 107 (1879).

66. *Brachyuromys*, F. Maj.
Ann. Mag. N. H. (6) xviii. p. 322 (1896).

67. *Hypogeomys*, Grandidier.
Rev. et Mag. Zool. 1869, p. 338.

68. *Gymnuromys*, F. Maj.
Ann. Mag. N. H. (6) xviii. p. 324 (1896).

69. *Eliurus*, M.-Edw.
Ann. Sci. Nat. (6) xx. art. 1, *bis*, p. 1 (1886).

(*d*) (American.)

70. *Onychomys*, Bd.
Mamm. N. A. p. 458 (1857).

71. *Peromyscus*, Glog.
Naturgesch. p. 95 (1841). [*Sitomys*, Fitz. SB. Ak. Wien, lvi. p. 97 (1867). *Vesperimus*, Coues, P. Ac. Philad. 1874, p. 178.]

[1] By an unfortunate accident Mr. Lydekker (Geogr. Mamm. p. 239, 1896) transposed to the recent *Lophiomys* Depéret's name *Trilophomys*, which was intended by its author for a renaming of his own fossil *Lophiomys*, 1890, *nec* M.-Edw. 1867. For the recent animal therefore Milne-Edwards's well-known name, being the earliest of all, is, of course, still available.

72. *Rhipidomys*, Tsch.
Faun. Peruan. p. 183 (1845).
73. *Tylomys*, Pet.
MB. Ak. Berl. 1866, p. 404.
74. *Holochilus*, Brandt.
Mém. Ac. Pétersb. iii. p. 428 (1835). [*Nectomys*, Pet.]
75. *Sigmodon*, Say & Ord.
Journ. Ac. Philad. iv. p. 352 (1825).
76. *Oryzomys*, Bd.
Mamm. N. A. p. 458 (1857).
77. *Reithrodontomys*, Gigl.
Ric. Distr. Geogr. Gen. p. 160 (1873). [*Ochetodon*, Coues, P. Ac. Philad. 1874, p. 184.]
78. *Eligmodontia*, F. Cuv.
Ann. Sci. Nat. (2) vii. p. 168 (1837). [*Calomys*, Waterh., *nec* Geoff. *Hesperomys* (s.s.), Waterh.]
79. *Neotomys*, Thos.
Ann. & Mag. N. H. (6) xiv. p. 346 (1894).
80. *Reithrodon*, Waterh.
P. Z. S. 1837, p. 29.
81. *Phyllotis*, Waterh.
P. Z. S. 1837, p. 28.
82. *Scapteromys*, Waterh.
P. Z. S. 1837, p. 20.
83. *Ichthyomys*, Thos.
P. Z. S. 1893, p. 337.
84. *Acodon*, Meyen.
N. Act. Leop. xvi. p. 600 (1833). [*Abrothrix*, Waterh. P. Z. S. 1837, p. 21.]
85. *Oxymycterus*, Waterh.
P. Z. S. 1837, p. 21.
86. *Blarinomys*, Thos.
Ann. & Mag. N. H. (6) xviii. p. 310 (1896).
87. *Notiomys*, Thos.
M.-Edw. Miss. Scient. Cap Horn, Mamm. p. 23 (1890).

J. NEOTOMINÆ.

88. *Neotoma*, Ord.
Journ. Ac. Philad. iv. p. 346 (1825).
89. *Xenomys*, Merr.
P. Biol. Soc. Wash. vii. p. 159 (1892).
90. *Hodomys*, Merr.
P. Ac. Philad. 1894, p. 232.

K. MICROTINÆ.

(*a*) 91. *Phenacomys*, Merr.
N. Am. Faun. no. 2, p. 28 (1889).

92. *Evotomys*, Coues.
P. Ac. Philad. 1874, p. 186.

93. *Microtus*, Schrank.
Fauna Boica, i. p. 66 (1798). [*Arvicola*, Lac. Mém. de l'Inst. iii. p. 495 (1801).]

(*b*) 94. *Synaptomys*, Bd.
Mamm. N. A. pp. xliv, 558 (1857).

95. *Lemmus*, Link.
Zool. Beytr. i. pt. 2, p. 75 (1795). [*Myodes*, Pall. Zoogr. Ross.-Asiat. p. 173 (1811).]

96. *Dicrostonyx*, Glog.
Naturgesch. p. 97 (1841). [*Cuniculus*, Wagl. Isis, 1832, p. 1220.]

(*c*) 97. *Ellobius*, Fisch.
Zoognosia, iii. p. 72 (1814).

L. SIPHNEINÆ[1].

98. *Siphneus*[2], Bts.
Het geslacht d. Muizen, p. 20 (1827).

VII. Spalacidæ[3].

A. RHIZOMYINÆ.

99. *Rhizomys*, Gray.
P. Z. S. 1831, p. 95.

[1] Mr. Gerrit Miller, to whose paper on Voles and Lemmings I am much indebted, has thrown doubt on the validity of the *Siphneinæ* as a subfamily (N. Am. Fauna, no. 12, p. 8, footnote, 1896), and in so far as regards *Ellobius*, hitherto always put with *Siphneus*, he is apparently correct, as its differences from the Voles and Lemmings do not seem to be much greater than those that separate these two groups from each other, and the Voles, Lemmings, and *Ellobius* may suitably form three groups of the subfamily *Microtinæ*. I have had to reverse the order of the genera from that given by Mr. Miller, in order to bring the Murine *Phenacomys* and *Evotomys* towards the Muridæ, *Synaptomys* towards the Voles, and the Lemmings, as a whole, towards *Ellobius*.

With regard to *Siphneus* itself, however, I think its peculiarities are amply sufficient to necessitate its being set over against all the rest of the group in a subfamily by itself. The modification that its anteorbital foramen has undergone, in comparison with that of the *Microtinæ*, is, however, curiously paralleled by that of the widely different *Spalacidæ*, and may be simply an adaptive modification due to a strictly talpine life. But in any case its differences, both external, cranial, and dental, are clearly sufficient to demand separate subfamily rank.

[2] Dr. J. A. Allen, Bull. Am. Mus. N. H. vii. p. 183 (1895), considers Kerr's *Myotalpa* should replace *Siphneus*; but as the result is attained by a method about the detailed working of which opinions are still divided, I provisionally use the better-known term.

[3] Not only do the *Bathyerginæ* of Alston's Spalacidæ of course go off to form a separate family, but it is very doubtful whether *Spalax* and *Rhizomys*, combined by him in the *Spalacinæ*, are rightly put even in one family, their resemblances being perhaps more adaptive than genetic. Winge puts *Rhizomys* with the Muridæ, and *Spalax* with the Dipodidæ, but does not give sufficient reasons for these allocations. This is one of those cases where a myological investigation is likely to be of much service; and the group is commended to the attention of Mr. Parsons, whose recent papers on Rodent myology have been of much

100. *Tachyoryctes*, Rüpp.[1]
[*Chrysomys*, Gray, List Mamm. B. M. p. 150 (1843).]

B. Spalacinæ.

101. *Spalax*, Güld.
Nov. Comm. Petrop. xiv. art. i. p. 409 (1770).

VIII. Geomyidæ.

102. *Geomys*[2], Raf.
Am. Month. Mag. ii. p. 45 (1817).
103. *Thomomys*, Wied.
N. Act. Leop. xix. pt. i. p. 383 (1839).

IX. Heteromyidæ.

A. Dipodomyinæ.

104. *Dipodomys*, Gray.
Ann. Mag. N. H. vii. p. 521 (1841).
105. *Perodipus*, Fitz.
SB. Ak. Wien, lvi. p. 126 (1867).
106. *Microdipodops*, Merr.
N. Am. Faun. no. 5, p. 115 (1891).

B. Heteromyinæ.

107. *Perognathus*[3], Wied.
N. Act. Ac. Leopold. xix. pt. i. p. 369 (1839).
108. *Heteromys*, Desm.
Mamm. ii. p. 313 (1822).

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service to me. Some important observations on the relations of the *Rhizomyinæ* to the Mascarene Sigmodontes are given by Dr. Forsyth Major, *suprà* p. 979.

[1] The African Bamboo-Rats, given provisionally the above name by Rüppell, were rightly distinguished by Gray, but the distinction has been generally lost sight of till now. The molars are of quite a different structure in the two groups.

It is unfortunate that Rüppell's name has to be used for this genus, as he deliberately rejected the idea of its being distinct (from *Bathyergus*!), and yet proposed the name in case other workers thought it valid. It is to be hoped that there are few people now left who would do a thing like this, by which an author attempts to secure priority for his own name at the expense of somebody else's work, while he fears to take the responsibility of describing a new form for himself. Some naturalists even refuse to accept such names, and I wish I could feel justified in doing the same.

[2] Dr. Merriam has divided the old genus *Geomys* into eight genera, but for the purposes of the present paper these may be most conveniently treated as of subgeneric rather than generic rank, sound as their basis as natural groups no doubt is.

[3] Dr. Coues (Mon. N. Am. Rod. p. 495, 1877) speaks of separate subfamilies for *Perognathus* and *Heteromys*; but they seem really to be very closely allied to each other, especially if some of the larger species of the former, such as *P. paradoxus*, be compared with members of the *H. alleni* group of *Heteromys*.

X. **Bathyergidæ.**

109. *Bathyergus*, Ill.
Prodr. Syst. Mamm. p. 86 (1811).
110. *Georychus*, Ill.
Prodr. Syst. Mamm. p. 87 (1811).
111. *Myoscalops*, Thos.
P. Z. S. 1890, p. 448. [*Heliophobius*, Pet. MB. Ak. Berl. 1846, p. 243.]
112. *Heterocephalus*, Rüpp.
Mus. Senckenb. iii. p. 99 (1842).

XI. **Dipodidæ.**

A. Sminthinæ.

113. *Sminthus*, Keys. & Blas.
Wirb. Europ. p. 38 (1840).

B. Zapodinæ[1].

114. *Zapus*, Coues.
Bull. U. S. Geol. Surv. ser. 2, no. 5, p. 253 (1873).

C. Dipodinæ.

115. *Dipus*, Gmel.
S. N. i. p. 157 (1788).
116. *Allactaga*, F. Cuv.
P. Z. S. 1836, p. 141.
117. *Platycercomys*, Brandt.
Bull. Ac. Pétersb. 1844, p. 209.
118. *Euchoreutes*, W. Scl.
P. Z. S. 1890, p. 610.

[1] The erection of the *Zapodinæ* into a family has been advocated by Dr. Coues (Mon. Am. Rod. p. 461, 1877), and, as a consequence, the giving to the *Dipodinæ* and *Pedetinæ* similar rank. Not only does this seem as unnecessary as it is inconvenient, but the characters of *Sminthus*, recognized as a Dipodid only since Dr. Coues wrote, appear to make the correctness of Alston's view more evident than ever. For with typical Dipodine teeth, it possesses an absolutely Zapodine skull, combined with a more Murine form than even *Zapus*. Moreover, the recent discovery of *Zapus* in the Old World (Poussargues, Bull. Mus. d'Hist. Nat. 1896, p. 1) removes the geographical isolation which may have influenced Dr. Coues in the conclusion he came to. The three subfamilies here recognized are no doubt well defined from each other, but if in any general raising of rank all round, such as many people (Americans especially) are fond of, these subfamilies are again made into families, it will have to be on some better ground than the untenable view adopted by Dr. Coues, that *Zapus* is as nearly allied to the Muridæ as it is to the Jerboas. *Pedetes*, on the other hand, as appears below, should certainly be removed from the family, its differences from all the Dipodidæ being infinitely greater than any of theirs from each other.

E. HYSTRICOMORPHA.

XII. **Pedetidæ**[1].

119. *Pedetes*, Ill.
Prodr. Syst. Mamm. p. 81 (1811).

XIII. **Octodontidæ.**

A. CTENODACTYLINÆ.

120. *Ctenodactylus*, Gray.
Spic. Zool. p. 10 (1830).

121. *Massoutiera*, Lat.
Le Nat. 1885, p. 21.

122. *Pectinator*, Bly.
J. A. S. B. xxiv. p. 294 (1855).

123. *Petromys*, A. Sm.
S. Afr. Q. J. ii. p. 2 (1831).

B. OCTODONTINÆ.

124. *Ctenomys*, De Blainv.
Bull. Soc. Philom. 1826, p. 62.

125. *Aconaemys*, Amegh.
Revist. Argent. i. p. 245 (1891). [*Schizodon*, Waterh. P. Z. S. 1841, p. 91, *nec* Agass.]

126. *Spalacopus*, Wagl.
Isis, 1832, p. 1219.

127. *Octodon*, Benn.
P. Z. S. 1832, p. 46.

128. *Abrocoma*, Waterh.
P. Z. S. 1837, p. 30.

C. LONCHERINÆ.

(*a*) 129. *Dactylomys*, Is. Geoff.
Ann. Sci. Nat. (2) x. p. 126 (1838).

130. *Thrinacodus*, Günth.
P. Z. S. 1879, p. 144.

[1] While many naturalists have noticed the Hystricomorph affinities of *Pedetes*, no one in modern times (except Dobson, who transferred the whole of the Dipodidæ) seems to have thought of actually placing it among them. To me this appears to be clearly the proper course, as there seems to be scarcely a character in its skull or teeth which is not found in one member or another of that group. Even its lower jaw is of a partially Hystricine type, and in any case is not of sufficient importance to outweigh its many affinities to the Hystricomorpha. Wiegmann in 1832 placed it among his "*Lagostomi*" (Handb. Zool. p. 56), but that was apparently rather by accident than good judgment, as his general classification is of a very antique type. All other authors seem to have kept it in the Dipodidæ, until Winge, in his general alteration of positions, placed it with *Anomalurus*, an allocation with which I feel quite unable to agree.

Within the Hystricomorpha it is difficult to say where *Pedetes* would best be placed. Its skull is very like that of *Thryonomys*, its teeth like those of *Spalacopus*, while it has also some resemblances to the Chinchillidæ. For the present, therefore, until further researches are made, I have put it at the beginning of the group, where it will occupy the same serial position as in Alston's paper, although shifted into a different section.

131. *Cannabateomys*, Jent.
Notes Leyd. Mus. xiii. p. 105 (1891).
132. *Loncheres*, Ill.
Prodr. Syst. Mamm. p. 90 (1811). [*Lasiuromys*, Dev. Rev. Zool. (2) iv. p. 353 (1852).]
(*b*) 133. *Thrichomys*, Trouess.
Bull. Soc. Sci. Angers, 1880, p. 179. [*Nelomys*, Lund, *nec* Jourd.]
134. *Cercomys*, F. Cuv.
Mamm. 6e livr. (1829).
135. *Carterodon*, Waterh.
Nat. Hist. Mamm. ii. p. 351 (1848).
136. *Mesomys*, Wagn.
Arch. f. Nat. 1845, pt. i. p. 145.
137. *Echinomys*, Desm.
N. Dict. d'H. N. x. p. 54 (1817).

D. CAPROMYINÆ.

138. *Myocastor*, Kerr[1].
Linn. An. K. p. 225 (1792). [*Myopotamus*, Geoff. Ann. Mus. vi. p. 81 (1805).]
139. *Capromys*, Desm.
Mém. Soc. d'H. N. i. p. 44 (1822).
140. *Plagiodontia*, F. Cuv.
Ann. Sci. Nat. (2) vi. p. 347 (1836).
141. *Thryonomys*, Fitz.
SB. Ak. Wien, lvi. p. 141 (1867). [*Aulacodus*, Temm. Mamm. i. p. 245 (1827), *nec* Eschsch. *Triaulacodus*, Lyd. Geogr. Distr. Mamm. p. 91 (1896).]

XIV. **Hystricidæ.**

142. *Hystrix*, Linn.
S. N. (10) i. p. 56 (1758).
143. *Atherura*, G. Cuv.
Règne Anim. éd. 2, i. p. 215 (1829).
144. *Trichys*, Günth.
P. Z. S. 1876, p. 739.

XV. **Erethizontidæ**[2].

A. ERETHIZONTINÆ.

145. *Erethizon*, F. Cuv.
Mém. d. Mus. ix. p. 426 (1822).

[1] See J. A. Allen, Bull. Am. Mus. N. H. vii. p. 182 (1895).

[2] The wide difference between the American and the Old World Porcupines has been realized by all naturalists, and after Mr. Parsons' strong observations on the differences in their myology (P. Z. S. 1894, p. 295), it seems better definitely to separate them into two families. With regard to *Chætomys*, the great difference between its teeth and those of the other *Erethizontidæ* makes it

146. *Coendou*, Lac.
Mém. de l'Inst. iii. p. 496 (1801). [*Synetheres* and *Cercolabes*, F. Cuv. Mém. Mus. ix. p. 427 (1822).]

B. CHÆTOMYINÆ.

147. *Chætomys*, Gray.
P. Z. S. 1848, p. 21.

XVI. **Chinchillidæ.**

148. *Chinchilla*, Benn.
Gard. Zool. Soc. i. p. 1 (1829).
149. *Lagidium*, Mey.
N. Act. Ac. Leop. xvi. p. 576 (1833).
150. *Lagostomus*, Brooks.
Trans. Linn. Soc. xvi. p. 102 (1828).

XVII. **Dasyproctidæ.**

151. *Dasyprocta*, Ill.
Prodr. Syst. Mamm. p. 93 (1811).
152. *Cœlogenys*, F. Cuv.
Ann. Mus. x. p. 203 (1807).

XVIII. **Dinomyidæ.**

153. *Dinomys*, Pet.
MB. Ak. Berl. 1873, p. 551.

XIX. **Caviidæ.**

154. *Cavia*, Pall.
Misc. Zool. p. 30 (1766).
155. *Dolichotis*, Desm.
Mamm. ii. p. 360 (1822).
156. *Hydrochœrus*, Briss.
Règne Anim. p. 116 (1756).

Suborder II. **DUPLICIDENTATI.**

F. LAGOMORPHA.

XX. **Ochotonidæ.**

157. *Ochotona*, Link.
Beytr. Nat. ii. p. 74 (1795). [*Lagomys*[1], G. Cuv. Tabl. Élém. p. 132 (1798).]

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at first sight difficult to believe that it is really a member of the family at all, and not a relative either of *Loncheres* or *Cœlogenys*, as Burmeister suggested. But further examination leads me to think that its dental resemblance to *Loncheres* is only superficial, and that its closeness to *Coendou* in other respects, including the identity of the structure of the feet and pterygoid regions, makes it best placed as a peculiar subfamily of the *Erethizontidæ*.

[1] *Lagomys* (1798), as used for the Pikas, is doubly invalid, as it is both later in date than Link's *Ochotona*, and is preoccupied by Storr's *Lagomys* (1780), which is a synonym of *Arctomys* (*cf.* Miller, Voles, p. 13, footnote 4).

XXI. Leporidæ.

158. *Romerolagus*, Merr.
P. Biol. Soc. Wash. x. p. 169 (1896).

159. *Lepus*, Linn.
S. N. (10) i. p. 57 (1758).

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Platacanthomys, 20.
Platycercomys, 117.
Pogonomys, 58.
Psammomys, 30.
Pteromys, 11.

Reithrodon, 80.
Reithrodontomys, 77.
Rheithrosciurus, 3.
Rhipidomys, 72.
Rhizomys, 99.
Rhombomys, 31.
Rhynchomys, 25.
Romerolagus, 158.
Saccostomus, 44.
Scapteromys, 82.
Schizodon, 125.
Sciuropterus, 12.
Sciurus, 5.
Sigmodon, 75.
Siphneus, 98.
Sitomys, 71.
Sminthus, 113.
Spalacopus, 126.
Spalax, 101.
Spermophilus, 7.
Steatomys, 37.
Synaptomys, 94.
Synetheres, 146.
Tachyoryctes, 100.
Tamias, 6.
Thomomys, 103.
Thrichomys, 133.
Thrinacodus, 130.
Thryonomys, 141.
Triaulacodus, 141.
Trichys, 144.
Tylomys, 73.
Typhlomys, 21.
Uromys, 58.
Vandeleuria, 48.
Vesperimus, 71.
Xenomys, 89.
Xeromys, 23.
Xerus, 4.
Zapus, 114.

7. On the Classification of the Palæozoic Echinoderms of the Group Ophiuroidea. By J. W. GREGORY, D.Sc., F.Z.S.

[Received November 5, 1896.]

For fifty years after Forbes, in 1840 [3. p. xiv], proposed to rank the Ophiuroidea as one of the classes of Echinoderma they were divided into two groups—the Ophiuræ and Euryalæ of Joh. Müller, the Ophiuridæ and Euryalidæ of Th. Lyman. In 1867 Dr. Axel Ljungman [7] divided the first group into six families (the Ophiodermatidæ, Ophiolepididæ, Amphiuridæ, Ophiomyxidæ, Ophiocomidæ, and Ophiothricidæ), but Mr. Lyman [10], in his description of the Ophiurids collected during the 'Challenger' Expedition, made no use of family divisions. He simply divided the Ophiuridæ into three groups, of which the first two were unnamed, and the third was merely described as comprising "Astrophyton-like Ophiuroids." Hence Lyman's great monograph, the richest mine of information in the whole range of literature on the Ophiurids, did not contribute so much to their classification as to our knowledge of their anatomy.

As neontologists were in difficulties owing to the lack of a satisfactory arrangement of the recent species, palæontologists were naturally in a worse state; for the anatomical characters of the fossil Ophiurids had been in but few cases satisfactorily determined. We have only to refer to Wright's introduction to the British Jurassic Starfish [20], or to Lütken's [9. pp. 70–75, 78] heroic attempt to improve the generic nomenclature of the Neozoic Ophiurids, to see how unscientific the existing systems were. In 1886 and 1890, Herr B. Stürtz, in two important memoirs [15, 16], described the anatomy of several genera from the Devonian of Bundenbach, in the Bavarian Pfalz. The fossils are pseudomorphs in iron pyrites; owing to the exceptional preservation of the specimens and the skill and patience with which Stürtz dissected them from their clay-slate matrix, their anatomical structure was well displayed. Stürtz's two papers are a great advance on any previous work dealing with Palæozoic Ophiurids; but the author

retained Joh. Müller's two orders, as he did also in his latest paper.

In 1892 a short and pregnant paper by Prof. F. J. Bell [1] lifted the classification of the Ophiurids on to a different plane. Bell recognized the great importance of the vertebral ossicles and that they are of three main types: (1) the "streptospondyline," where the vertebral ossicles articulate by saddle-shaped surfaces, which do not bear lateral processes or pits; (2) the "zygospondyline," where lateral processes and pits on the articular surfaces of vertebral ossicles limit the power of movement; (3) the "cladophiuroid" (or astrophiuroid), where the vertebral ossicles articulate by hourglass-shaped surfaces.

Bell therefore proposed to divide the Ophiurids into three groups: (1) the Streptophiuræ, for those with streptospondyline ossicles; (2) the Cladophiuræ, for those with hourglass-shaped articulations; (3) the Zygophiuræ, for those with zygospondyline ossicles.

The definition of these three orders was no doubt a great improvement on any previous arrangement of the Ophiurids. There is, however, considerable difficulty in applying this system to the fossil forms, especially in the case of the Streptophiuræ. It appears doubtful whether even some recent genera, as *Ophiohelus*, can be correctly described as having vertebral ossicles articulating by ball-and-socket joints. But this statement certainly cannot be made of many Palæozoic Ophiurids, which represent a more primitive condition than that of the recent species; they are indeed so primitive that they cannot be made to enter into any of Bell's orders.

The two most striking characters of these Palæozoic genera are the absence of ventral arm-plates[1] and of true vertebral ossicles. The latter are represented by free paired plates, like the ambulacral ossicles of Asterids.

The ambulacral ossicles are the most important plates in the arms of both Asterids and Ophiurids, so that it is *à priori* probable that they offer a better basis for classification than the external arm-plates. As we descend from the Zygophiuræ, first to the Cladophiuræ, and then to the Streptophiuræ, we notice a decrease in the complexity and completeness of the vertebral ossicles. It is not therefore surprising, when we go back to Palæozoic times, to find Ophiurids with an arm-structure still simpler than anything found in the Streptophiuræ. In these early forms the central arm-ossicles occur as a double series of free plates, below which is an open ambulacral groove. Hence the arms appear, at first sight, to be Asterid rather than Ophiurid in arrangement.

Hence I propose to found a fourth order of Ophiuroidea to include those without vertebral ossicles, but which have in each arm a double series of free ambulacral plates, which articulate like

[1] This character is also found in the genus *Ophioteresis* of Bell, one of the most primitive of living Ophiurids; it has, however, vertebral ossicles with streptospondyline articulations.

those of Asterids and of the Echinid *Palæodiscus*. As the two elements which have fused to form the vertebral ossicles of later Ophiurids are unattached in the members of this order, I propose for it the name Lysophiuræ[1].

No one has worked at the Palæozoic Ophiurids without being impressed by the unsatisfactory nature of many of the genera. In my earliest palæontological paper (1889) I pointed out that *Protaster* would have to be split up into more than two genera [5. p. 27]. Stürtz, both in 1890 [16. p. 245] and 1893 [17. p. 19], also insisted that *Protaster* includes a miscellaneous group of species, and that the Protasters of Forbes, Billings, Hall, and myself are distinct. I shrank from the task of dismembering this genus in 1889, as I hoped for better specimens of the type species. None such, however, have been forthcoming. As I am now bound to attempt to indicate the relations of the fossil and recent forms in an account of the Ophiuroidea for Prof. Lankester's 'Oxford Natural History,' I delay no longer. In order to simplify my task in that place, I offer the following synopsis of the classification of the Palæozoic Ophiurids, with diagnoses of some of the genera.

Order I. LYSOPHIURÆ.

Diagnosis.—Ophiuroidea of which the ambulacral ossicles are alternate and are not united into vertebral ossicles. There are no ventral arm-plates, and the underside of the arm is occupied by an ambulacral furrow.

Remarks.—This order includes a group of Palæozoic Ophiurids in which the arm-structure is on the same plan as in the Asterids; for there are no ventral arm-plates, there is an ambulacral groove, and the ambulacral plates are in double series. The members of the order differ from the Asterids by having the arms sharply marked off from the disc; while the alimentary canal was, in all probability, entirely limited to the disc.

So far as is known at present, the order was limited to the Palæozoic period; but it is necessary to consider whether a few recent forms ought not to enter it. In *Ophiohelus* and *Ophiotholia* the ambulacral plates occur as pairs of rod-like plates, instead of as vertebral ossicles. They therefore, in this respect, resemble Lysophiurids. On application to the Zoological Department of the British Museum, I find that both genera are represented only by the small single specimens dredged by the 'Challenger.' It is too great a responsibility to subject these fragile type specimens to the risk of re-examination, especially as the nature of the articular surfaces could not be determined without dissection. Both specimens are so small, that, as Prof. Bell suggests, it is quite possible they are not mature.

The members of the two genera, however, differ from the Palæozoic Lysophiuræ in three respects: they have the ambulacral

[1] From λύσις, dissolution, unattachment.

plates opposite one another; they have dorsal and ventral arm-plates; they have no ambulacral groove. To include these genera among the Lysophiuræ would limit the diagnosis of that order to the single character of the unfused nature of the ambulacral plates.

It is therefore advisable to retain *Ophiohelus* and *Ophiotholia* among the Streptophiuræ and attribute the character of their ambulacral plates either to immaturity or degeneration. Support to this conclusion is given by the fact that even among the Zygophiuræ the ambulacral ossicles begin as pairs of simple free bars (Ludwig, 8. Bd. ii. p. 94, pl. x. figs. 2–5).

Family 1. Protasteridæ.

Diagnosis.—Lysophiuræ which have boot-shaped ambulacral ossicles. Each of them consists of a "body" lying beside the middle line of the arm, and of a lateral "wing" projecting transversely from the body of the ossicle.

Genus 1. Protaster, Forbes, 1849 [4. pl. iv.].

Synonyms:

Protaster, Hall.

Protaster pars of Salter, Billings, Miller, Gregory, Stürtz.

Non *Protaster* of Meek and Worthen, Dewalque, Davy.

Diagnosis.—Protasteridæ with a well-marked disc; long, tapering, very flexible arms. Some of the adambulacral ossicles are Y-shaped. Scales of the disc fairly large.

Type species.—*Protaster sedgwicki*, Forbes, 1849. Silurian, Westmoreland. (Fig. 1*a*, *b*, *c*.)

Fig. 1.

a *b* *c*

Protaster sedgwicki, Forbes: the structure of the arm; *a*, near the distal end; *b*, in the middle; *c*, at the proximal end.

Remarks.—This genus was founded by Forbes on specimens from the Ludlow rocks of Kendal, Westmoreland, which are in the Cambridge Museum[1]. Forbes's figures of the arm-structure are not satisfactory, and the accompanying diagrams will help to explain it.

[1] I must express my thanks to Prof. T. McKenny Hughes and Mr. H. Woods for facilities in examining the type. I am indebted to Mr. E. T. Newton and Mr. H. Allen for the opportunity of seeing the actual mould which was studied by Forbes, and also for that of describing the following species.

Forbes's figure represents the ambulacral ossicles as being alternately large and small. It is quite possible that each small pair represents a segment, and that the smaller ossicles have been reduced by absorption in order to give space for the podia. This explanation, however, seems improbable; for in that case there would be only one podion, instead of a pair, to each segment. The correct explanation appears to be that the smaller pieces are only triangular, distal portions of the ambulacral ossicles, apparently separated from the proximal portion by a groove. The ambulacral plates of *Cheiroptaster giganteus*, Stürtz [16. pl. xxx.], for example, are forked, and the junction is depressed; if we only knew this genus from internal casts, it would appear that the two prongs of the forked piece were separate. Many old figures represent Palæozoic Ophiurids as having the ambulacral ossicles alternately large and small; but it is quite possible that the explanation suggested will account for all such cases.

PROTASTER BIFORIS [1], n. sp. (Figs. 2, 3, p. 1033.)

Diagnosis.—Disc fairly large; interbrachial outlines concave. The syngnaths [2] are simple, prominent, and stout. The ambulacral ossicles consist of a thick body and a stout curved wing. The distal margin of the ossicles is notched by a depression for a ventral muscle-field, which also cuts into the proximal margin of the adjoining ossicle. Owing to these muscular depressions the arm has apparently two series of pores.

The adambulacral ossicles are massive and taper slightly to their distal ends; they are closely attached and form a regular series of marginal plates.

Arms very flexible.

Dimensions:

Length of longest arm	18	mm. + *x*.
Diameter of arm at the base	2·5	„
„ arm near the distal end	1	„
„ mouth	1·5	„
Length of syngnath	1	„
Width of ambulacral furrow at edge of disc.	1·25	„

Distribution.—Wenlock Shale. Castell Dinas, Bran, near Llangollen. Mus. Pract. Geol. No. VI. | $\frac{6}{11}$.

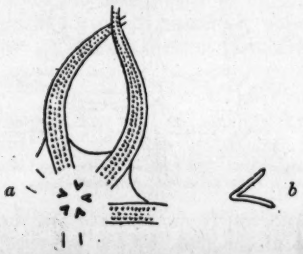
Affinities.—This species of *Protaster* differs from *P. sedgwicki*, Forbes, in having concave interbrachial outlines and roughly triangular adambulacral ossicles, and also by the character of the ambulacral ossicles. The species is of interest as showing that the flexibility of the arms is due to the great development of some ventral inter-ambulacral muscles. Thereby the arms could be rolled up ventrally and the ambulacral furrow thus protected.

[1] *Biforis*, having two holes or openings; a character due to the hole-like appearance of the ventral muscle-pits.

[2] "Syngnath," the united piece formed of mouth-frame and jaw. The "Mundecksteck."

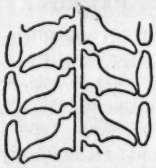
This new species differs from *Protaster forbesi*, Hall [No. 6. pp. 293–294, pl. ix. figs. 5, 6], by the interbrachial margins of the disc being concave: in *P. forbesi*, moreover, the adambulacral ossicles are free distally, and each bears a single large spine: the ambulacral ossicles of the two species are also differently shaped.

Fig. 2.



Protaster biforis: *a*, outline of the disc and arms; *b*, a pair of syngnaths.

Fig. 3.



Protaster biforis: diagram of the arm-structure.

It was suggested in the description of *P. sedgwicki* that the apparent alternation of large and small ambulacral ossicles in that species and some other genera was probably due to a series of depressions across the ossicles. The present species suggests a possible explanation of the nature of those depressions, for they probably had the same function as the deep pits in the ossicles of the new species; and these, in all probability, were for the lodgment of the ventral muscles which moved the arms.

Genus 2. Bundenbachia, Stürtz, 1886 [15. p. 83].

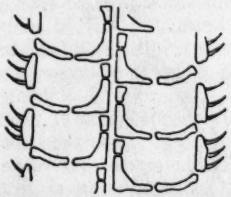
Diagnosis.—Disc soft and delicate; covering-plates apparently small and thin. Ambulacral ossicles with a dumbbell-shaped body and thin tapering wing. The body of the ossicle is apparently divided into two pieces by a transverse depression. The adambulacral plates are small and narrow, and support a triangular spine-bearing plate.

The syngnaths are curved, narrow bars.

Type species.—*Bundenbachia beneckei*, Stürtz.

Remarks.—The diagnosis of this genus is based on specimens in the British Museum received from Herr Stürtz. The diagram (fig. 4) has been prepared from specimen B.M. No. E 3495.

Fig. 4.



Bundenbachia: arm-structure.

Bundenbachia differs from *Protaster* by the irregular nature and soft plating of the disc, by the presence of spine-bearing plates attached to the adambulacral ossicles, and by the different form of the ambulacral ossicles.

Family 2. Palæophiuridæ.

Diagnosis.—Lysophiuræ in which the ambulacral ossicles are long and bar-shaped, with the longer axis parallel to the arm.

Remarks.—This family agrees with the Protasteridæ in not having the ambulacral ossicles of each segment placed opposite one another. It differs by having the ambulacral ossicles longer than wide, and never divided transversely by muscular depressions. The ambulacral ossicles are either bar-shaped or thickened to a subquadrate form. They are never boot-shaped.

Genus 1. Palæophiura, Stürtz, 1890 [16. p. 233].

Diagnosis.—Palæophiuridæ with the disc surrounded by rod-shaped marginal ossicles. The ambulacral ossicles are rods lying parallel to the arm.

Distribution.—Lower Devonian, Bundenbach.

Type species.—*Palæophiura simplex*, Stürtz.

Genus 2. Sturtzura, nov. gen.

Diagnosis.—Palæophiuridæ having thick, subquadrate, ambulacral ossicles and narrow adambulacral plates. The disc is fragile, and its plates are small and thin: it has no marginal plates. The mouth-frames are narrow and separate.

Distribution.—Silurian, England and Australia.

Type species.—*Sturtzura brisingoides* (Gregory), 1889 [5].

Remarks.—This genus differs from *Palæophiura*, as the ambulacral ossicles are thick and subquadrate, instead of being in the

form of narrow bars; also by the absence of the strong marginal plates round the disc. The genus contains two species, *S. brisingoides* (Greg.) and *S. leptosoma* (Salt.) [13. p. 331, pl. ix. fig. 5], both of which were originally placed in *Protaster*.

The genus differs from *Protaster* by the family character of having bar-shaped instead of boot-shaped ambulacral ossicles.

I have pleasure in naming this genus after Herr Stürtz, whose careful dissections have added so greatly to our knowledge of the Palæozoic Ophiurids, and who has previously pointed out [17] that these two species are generically distinct from *Protaster*.

Genus 3. Tæniura, nov. gen.

Diagnosis.—Palæophiuridæ with a small pentagonal disc, not bounded by marginal ossicles. The ambulacral furrow is broad. The oral skeleton is conspicuous and the syngnaths each composed of two separate pieces. The two jaws of each oral angle are closely attached; the mouth-frames are separated and each of them is a short, thick, slightly bent bar.

Distribution.—Trenton Limestone, Ottawa.

Type species.—*Tæniura cylindricus* (Billings) [2. pp. 81–82, pl. x. figs. 4 *a*, 4 *b*].

Remarks.—This genus differs from *Palæophiura* by the absence of marginal ossicles from the disc, and from *Sturtzura* by the smaller size of the disc and the form of the syngnaths. In *Sturtzura* the jaws end bluntly against a jaw-plate, whereas in *Tæniura* they appear to taper to a point and have no jaw-plate.

This genus is necessary for the second species included by Billings in his genus *Tæniaster*. The genus was described as discless, which in respect to the type species *S. spinosus* is correct. In that species the oral skeleton consists of five pairs of large adambulacrals as in ordinary Asterids. The affinities of the true *Tæniaster* appear to me to be with such forms as *Palæaster ruthveni* (Forbes) [4. dec. 1, pl. i. fig. 1]. It is asteroid in the oral armature, in its alternately arranged ambulacral ossicles [1], and in the absence of a disc. I therefore consider *Tæniaster* a genus of Asteroidea. The second species placed by Billings in this genus has, however, a well-marked disc [2], and has the oral armature composed of five pairs of Ophiuroid syngnaths. It must therefore be included among the Ophuiroidea.

Genus 4. Eugaster, Hall, 1867 [6. p. 290, pl. ix. figs. 7, 8].

Diagnosis.—Palæophiuridæ in which the ambulacral ossicles are subheptagonal in form, the central suture along the arm being zigzag, while the outer angles of the ossicles are cut away for the

[1] Billings in his description (2. p. 81) attributes the alternation of the ossicles in *Tæniaster spinosus* to distortion; but this explanation is not consistent with his figure. If distortion had separated the pairs of ambulacral ossicles it ought also to have displaced the syngnaths; but those of each pair are left precisely opposite.

[2] Billings, *op. cit.* pl. x. fig. 4 *a*.

reception of the podia. The adambulacral ossicles have a flat base, and thence bend forward crescentically. The mouth-frames are massive, and those of each pair meet along the middle line of the oral angle.

Distribution.—Hamilton Series, Middle Devonian, Madeson County, New York.

Type species.—*Eugaster logani*, Hall.

Remarks.—This genus I only know from Prof. Jas. Hall's figures, and in spite of their clearness I feel much doubt as to the wisdom of diagnosing it from these alone. Its affinities are clearly with the Palæophiuridæ, but it approaches the Protasteridæ in one respect: for, owing to the deep depressions in the outer angles of the ambulacral ossicles, the outer side forms a short rudimentary wing. The genus differs from all the Protasteridæ by the absence of a muscular groove across the ambulacral ossicles.

Among the Palæophiuridæ it differs from *Palæophiura* by the absence of marginal ossicles, and from *Sturtzura* and *Tæniura* by the massive nature of the mouth-frames.

Genus 5. Ptilonaster, Hall, 1867.

Distribution.—Chemung Series, Upper Devonian, Cortlandville, New York State.

Type species.—*Ptilonaster princeps*, Hall, 1867 [6. p. 292, pl. ix. fig. 9].

Remarks.—This genus is an ally of *Eugaster*, as Lütken [9. pt. iii. p. 82] has already remarked; it is, however, generically distinct. I only know it from Hall's figures, and therefore prefer to leave the preparation of a formal diagnosis to an American palæontologist.

Order II. STREPTOPHIURÆ, Bell, 1892.

Diagnosis.—Ophiuroida in which the ambulacral ossicles are opposite and are generally fused into vertebral ossicles. In such cases the vertebral ossicles articulate by a more or less simple ball-and-socket joint. The covering-plates of the arms are more or less regularly developed, and consist of a superior, an inferior, and a pair of lateral arm-plates to each segment. The lateral arm-plates generally bear spines.

Remarks.—The main character of this order is that the ambulacral ossicles are paired, but primitive. The order differs from the preceding by having the vertebral ossicles always opposite instead of alternate. In some of the simplest members of the order, as *Ophiurina*, the ossicles are not fused, there are no ventral arm-shields, and an ambulacral furrow runs along the ventral side of the arm. In the next higher family, as in the genus *Lapworthura*, the ambulacral ossicles are fused, but have plain articulating surfaces, and there is an ambulacral furrow. In recent members of the group the vertebral ossicles are of a more complex type, but the articulating surfaces are streptospondyline; in some, such as

Ophioteresis (Bell, 1. pp. 178–9, pl. xi. figs. 1–5), there are no ventral arm-plates, but this is very exceptional among recent members of the group.

Family 1. Ophiurinidæ.

Diagnosis.—Streptophiuræ with ambulacral ossicles, only slightly united, and without ventral arm-plates.

Genus 1. Ophiurina, Stürtz, 1890 [16. p. 232].

Diagnosis.—Disc circular, with marginal plates. Ambulacral ossicles long, narrow bars. Syngnaths rod-shaped. Adambulacral plates absent or altogether lost from the fossil.

Distribution.—Lower Devonian, Bundenbach.

Type species.—*Ophiurina lymani*, Stürtz, 1890.

Genus 2. Tremataster, Worth. & Mill. 1883.

Diagnosis.—Disc with concave interbrachial outlines. No marginal plates. Ambulacral ossicles short. Adambulacrals present.

Distribution.—Chester Limestone, Lower Carboniferous, Illinois.

Type species.—*Tremataster difficilis*, Worth. & Mill. 1883 [19. p. 330, pl. xxxi. fig. 3][1].

Family 2. Lapworthuridæ.

Diagnosis.—Streptophiuroida without ventral arm-plates or buccal shields; ambulacral ossicles fused, but their articulating surfaces are plain. Madreporite dorsal.

Genus 1. Lapworthura, nov. gen.

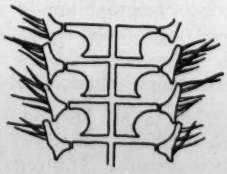
Diagnosis.—Disc circular, well-marked. Arms very flexible, broad; at first uniform in width and then tapering slowly. Ambulacral ossicles with the distal and proximal margins parallel; with lateral wings curving round the podial pores. Madreporite large.

Distribution.—Ludlow Series, Silurian, Ludlow.

Type species.—*Lapworthura miltoni* (Salter), 1857 [13. p. 330, pl. ix. fig. 4; 14].

The arm-structure is shown in fig. 5.

Fig. 5.



Lapworthura: diagram of the arm-structure, seen from ventral side.

[1] The *Protaster decheni*. Dew. (Ann. Soc. géol. Belg. vol. viii. 1880, pp. 52–54, pl. iii. figs. 1–2), is probably also a member of this genus.

Genus 2. FURCASTER, Stürtz, 1886 [15. p. 79].

Diagnosis.—Disc circular small. Arms short, narrow, slightly flexible, tapering gradually. Ambulacral ossicles of a long central body and two short wings, which are attached only to the anterior corner of the ossicle.

Distribution.—Lower Devonian, Bundenbach.

Type species.—*Furcaster palæozoicus*, Stürtz[1].

Remarks.—In Stürtz's description he refers to the existence in this genus of ventral arm-plates, and even figures them. His type specimens are now in the British Museum, but I cannot verify the existence of any ventral arm-plates. His type (B.M. E 3805), for example, seems to me to show almost conclusively that an open furrow ran along the underside of the arm.

Genus 3. PALASTROPECTEN, Stürtz, 1886 [15. p. 88].

Diagnosis.—Disc circular, large (badly preserved in the specimens; probably originally soft and irregular). Arms thick, broad, and somewhat lanceolate in shape. Ambulacral ossicles narrow, the lateral wings resting on the whole body of the ossicle.

Distribution.—Lower Devonian, Bundenbach.

Type species.—*Palastropecten zitteli*, Stürtz, 1886 [15].

Aganaster, sp., Miller & Gurley [12. p. 57, pl. ix. figs. 10, 11], seems to me to be allied to *Lapworthura*, and at least a member of the same family. It apparently has no ventral arm-plates, but an open furrow, and thus differs widely from *Aganaster* It is probably a new genus.

Family 3. EOLUIDIDÆ.

Diagnosis.—Streptophiuræ with the ambulacral ossicles united to form vertebral ossicles. Ventral arm-plates present, but there are no buccal shields. (Dorsal arm-plates present only in the highest genus.)

Remarks.—This family includes three Devonian genera, which differ from the previous families of this order by the presence of ventral arm-plates and by having vertebral ossicles, which articulate (? always) by simple rounded pits and processes. The family differs from living Streptophiuræ by the absence of buccal shields and the simplicity of the oral armature.

Genus 1. EOLUIDIA, Stürtz, 1886 [15. p. 89].

Diagnosis.—Disc rather large; the interbrachial outlines are deeply concave. Each syngnath consists of pairs of mouth-frames and jaws; a jaw-plate is present. The vertebral ossicles are small and the union of the two lateral elements incomplete; the lateral

[1] The *Protaster daoulasensis*, Davy (Bull. Soc. géol. France, ser. 3, vol. xiv. pp. 182–187), is an ally of *Furcaster*.

wings are thin. The adambulacral plates are triangular and each of them bears several spines. The pores for the podia occur at the middle of the lateral margin of the ventral arm-shields.

Distribution.—Lower Devonian, Bundenbach.

Type species.—*Eoluidia decheni*, Stürtz, 1886.

Genus 2. Eospondylus, nov. gen.

Diagnosis.—Disc circular. Ambulacral ossicles completely fused into vertebral ossicles, each of which, however, is traversed by a pore. The adambulacral ossicles are somewhat pear-shaped. The podial pores are at the posterior angles of the ventral arm-plates.

Distribution.—Lower Devonian, Bundenbach.

Type species.—*Eospondylus primigenia* (Stürtz), 1886 [15. p. 77].

Genus 3. Miospondylus, nov. gen.

Diagnosis.—Disc circular. Ambulacral ossicles completely united; each half of the vertebral ossicle is boot-shaped. The oral angles each consist of a pair of syngnaths without jaw-plate. The ventral arm-plates are small, and are not notched by podial pores.

Distribution.—Lower Devonian, Bundenbach.

Type species.—*Miospondylus rhenanus* (Stürtz), 1893 [17. p. 29, pl. i. figs. 1–3].

Remarks.—The two genera *Eospondylus* and *Miospondylus* are both founded on species described by Stürtz, and included by him in *Ophiura*. It is impossible that they can remain in this genus, and Stürtz, no doubt, only placed them there provisionally. They agree in family characters with *Eoluidia*, but differ from it in the structure of both the ambulacral and adambulacral plates. The differences between them would certainly rank as of generic value among recent Ophiurids. To leave the two species in *Eoluidia* would only encourage the neglect of specific characters and a looseness of description which has already greatly retarded the study of the fossil Ophiurids.

Genus 4. Aganaster, Miller & Gurley, 1890.

Syn. *Ophiopege*, Böhm.

This genus was proposed by its authors to include a species described as *Protaster gregarius* by Worthen and Meek. It has nothing to do with *Protaster* and is clearly a member of the Streptophiuræ. As far as its characters are known to me it must be included among the Eoluididæ. It differs from the rest of this family by the presence of dorsal arm-plates.

Without the opportunity for the examination of more specimens than there are in the British Museum, I do not care to attempt a new diagnosis. Improvements on the original diagnosis of Miller and Gurley must be left to American palæontologists.

Böhm has founded the genus *Ophiopeza* on the type species of *Aganaster* [2 *a*. p. 159].

The genus *Cholaster* of Worthen and Miller [19. pp. 328–329, pl. xxxi. fig. 4] appears to be allied to *Aganaster*, but the structure of the ambulacral ossicles is unknown.

Family 4. Onychasteridæ.

Diagnosis.—Streptophiuræ with well-developed vertebral ossicles, and with very flexible, contorted, unbranched arms; there are no external arm-plates, the integument containing granules only.

Distribution.—Keokuk and Burlington Stages, Lower Carboniferous, Iowa and Illinois.

Genus Onychaster, Meek & Worth.

Type species.—*Onychaster flexilis*, Meek & Worth. [Proc. Acad. Nat. Sci. Phil. 1869, p. 83; 11. pp. 526–528; 11 *a*. p. 510, pl. xvi. fig. 3].

Remarks.—This interesting genus has hitherto been placed among the Euryalidæ, of which it has been regarded as the best known fossil representative. As Prof. Bell, however, has remarked, Meek and Worthen's clear figures of the vertebral ossicles show that the articular surfaces are Streptospondyline and not Cladiophiuroid.

Family 5. Eucladiidæ.

Diagnosis.—Streptophiuræ with contorted branching arms. There are five pairs of large plates (? radial shields) on the abactinal side. The madreporite is large and dorsal in position. The arms have no external arm-plates, but are covered by a granular integument. Ambulacral ossicles primitively Streptospondyline.

Genus Eucladia, H. Woodward, 1869 [18].

Type species.—*Eucladia johnsoni*, H. Woodward, Lower Ludlow, near Dudley.

Remarks.—The affinities of this magnificent Starfish have been left in some doubt owing to the absence of information as to the structure of the vertebral ossicles. It has generally been assigned to the Euryalidæ, owing to its granular integument and branching contorted arms. Fortunately, however, I have found the articular surface of the vertebral ossicles exposed on the side of the block of limestone containing the specimen. The articulation is truly Streptospondyline of a rather primitive type (fig. 6 *a*, *b*, p. 1041). The ossicle is egg-shaped in section, with the broader end above. Two broad muscle-fields occur, one at each of the quadrants of the ossicle. On the central line just above these there is a small knob. The upper half of the ossicle is occupied by two pairs of depressions separated by simple ridges.

The structure is on essentially the same plan as that of *Onychaster* and it is clearly Streptospondyline in character. The genus

Fig. 6.

a *b*

a & *b*, articular surfaces of the vertebral ossicles of *Eucladia*. $\frac{1}{1}^{0}$.

is therefore to be included among the Streptophiuræ, the resemblances to the Euryalidæ being homoplastic modifications to suit its mode of life.

The Homologies of the Madreporite.

The madreporite in *Eucladia* is certainly dorsal, as Dr. Woodward correctly stated; it has been suggested that this character removes the genus from the Ophiuroidea. In that case *Lapworthura* and probably *Protaster* will also have to be excluded from this subclass. But in most Echinoderms the water vascular aperture opens on the aboral surface. According to Bury [2 *b*. pl. xxxvii. fig. 2, pp. 422–423], the water-pore of the Ophiuroidea originally occupies this position. It is therefore not unreasonable to suppose that in the earliest Ophiurids the water-pore was originally dorsal, and that it subsequently worked round to the ventral side, as it does during the development of the Spatangoida. Hence one cannot use the dorsal position of the madreporite in Palæozoic Stellerids as a proof that they are not Ophiurids.

It follows from this, however, that the madreporite (or plate in which the water-pore opens) of *Lapworthura* and *Eucladia* is not homologous with the madreporite of recent Ophiurids, which belongs ontogenetically to the oral system. Carpenter and Bury have both adduced strong reasons to show that the madreporite of Ophiurids is not homologous with that of Asterids. The evidence of the Palæozoic genera of both groups shows that this plate is not homologous in all the members of even the same subclass. It is certain that in some Ophiurids the madreporite is oral, and that in others it is not. Hence it is quite possible that in those Asterids with a ventral madreporite, the plate may be a member of the oral system.

Although, therefore, the madreporite may originate ontogenetically on an oral, it does not do so phylogenetically, and the situation of the water-pore on an oral plate has resulted only from a secondary modification.

Synopsis of Classification.

Class **STELLEROIDA.**

Subclass OPHIUROIDEA.

Order I. **Lysophiuræ.**—Ambulacral ossicles alternate, free. No ventral arm-plates.

Fam. 1. PROTASTERIDÆ. Boot-shaped ambulacral ossicles.
Genera.—*Protaster*, Forbes.
Bundenbachia, Stürtz.

Fam. 2. PALÆOPHIURIDÆ. Long bar-shaped ambulacral ossicles.
Genera.—*Sturtzura*, Greg.
Palæophiura, Stürtz.
Tæniura, Greg.
Eugaster, Hall.
Ptilonaster, Hall.

Order II. **Streptophiuræ.** Vertebral ossicles present, with more or less Streptospondyline articulations

Fam. 1. OPHIURINIDÆ. Ambulacral ossicles slightly united and no ventral arm-plates.
Genera.—*Ophiurina*, Stürtz.
Tremataster, Worth. & Mill.

Fam. 2. LAPWORTHURIDÆ. Ambulacral ossicles fused. No ventral arm-plates. Madreporite dorsal.
Genera.—*Lapworthura*, Greg.
Furcaster, Stürtz.
Palastropecten, Stürtz.

Fam. 3. EOLUIDIDÆ. Vertebral ossicles. Ventral arm-plates, but no buccal shields.
Genera.—*Eoluidia*, Stürtz.
Eospondylus, Greg.
Miospondylus, Greg.
Aganaster, Mill. & Gurl.
Cholaster, Worth. & Mill.

Fam. 4. ONYCHASTERIDÆ. Contorted unbranched arms. Integument granular.
Genus.—*Onychaster*, Meek & Worth.

Fam. 5. EUCLADIIDÆ. Contorted branched arms. Integument granular.
Genus.—*Eucladia*, H. Woodw.

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APPENDIX.

LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

DURING THE YEAR

1896.

Jan. 1. 1 Common Marmoset (*Hapale jacchus*). Presented by Capt. Pickthorn.

4 Pratincoles (*Glareola pratincola*). Presented by Lord Lilford, F.Z.S.

4 Marbled Ducks (*Marmoronetta angustirostris*). Presented by Lord Lilford, F.Z.S.

2 Passerine Parrakeets (*Psittacula passerina*). Presented by Mrs. Robert M^{c}Cabe.

2. 1 Ring-necked Parrakeet (*Palæornis torquata*), ♀. Presented by Mrs. E. Parrot.

4. 1 Amazonian Manatee (*Manatus inunguis*), ♂. From the Rio Purus, Amazons. Purchased. See P. Z. S. 1896, p. 212.

1 Southern River-Hog (*Potamochærus africanus*), ♀. Presented by Wm. Anthony Morgan, Esq.

1 Black-handed Spider-Monkey (*Ateles geoffroyi*), ♀. Purchased.

2 Graceful Ground-Doves (*Geopelia cuneata*). Purchased.

1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by B. T. Frere, Esq.

6. 2 Polecats (*Mustela putorius*), ♂ ♀. Presented by A. H. Cocks, Esq., F.Z.S.

7. 2 West-African Love-birds (*Agapornis pullaria*). Presented by Mrs. Otto Fell.

2 King Penguins (*Aptenodytes pennanti*, jr.). From Macquarie Island. Purchased. See P. Z. S. 1896, p. 212.

9. 1 Crowned Duiker-bok (*Cephalophus coronotus*), ♀. Purchased.

10. 1 Yellow-fronted Amazon (*Chrysotis ochrocephala*). Presented by Lieut.-Gen. Arthur Lyttleton-Annesly, F.Z.S.

11. 1 Persian Gazelle (*Gazella subgutturosa*), ♂. Presented by Sir F. Greswolde-Williams.

13. 1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♂. Presented by Miss Louisa Hutt.

1 Puff-Adder (*Bitis arietans*). Presented by J. E. Matcham, Esq.

14. 2 Golden-crowned Conures (*Conurus aureus*). Deposited.

Jan. 15. 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♂. Presented by W. Engelhardt, Esq.
16. 2 Black-headed Caiques (*Caica melanocephala*). Purchased.
17. 1 Green-cheeked Amazon (*Chrysotis viridigenalis*). Purchased.
20. 1 Saltwater Terrapin (*Malacoclemmys terrapin*). Presented by J. Lea Smith, Esq., F.Z.S.
21. 1 Black-faced Kangaroo (*Macropus melanops*), ♀. Presented by E. Mitchell, Esq., M.A.
22. 2 Indian Jerboas (*Alactaga indica*). Purchased.
1 Himalayan Bear (*Ursus tibetanus*), ♀. Presented by Capt. Gale.
1 Slow Loris (*Nycticebus tardigradus*). Presented by Capt. J. W. Carrothers.
24. 6 Gallot's Lizards (*Lacerta galloti*). Presented by H. B. Hewetson, Esq., M.R.C.S., F.Z.S.
1 Sharp-headed Lizard (*Lacerta dugesi*). Presented by H. B. Hewetson, Esq., M.R.C.S., F.Z.S.
1 Delalande's Gecko (*Tarentola delalandii*). Presented by H. B. Hewetson, Esq., M.R.C.S., F.Z.S.
27. 1 Common Boa (*Boa constrictor*). From Trinidad. Presented by E. A. Cumberland, Esq.
28. 1 Isabelline Antelope (*Cervicapra isabellina*). Deposited.
1 Cormorant (*Phalacrocorax carbo*). Deposited.
30. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Edward Sheriff, Esq.
31. 1 Kinkajou (*Cercoleptes caudivolvulus*). Deposited.

Feb. 1. 2 Banded Fruit-Pigeons (*Ptilopus fasciatus*). Deposited.
1 Sharp-snouted Snake (*Dryophis mycterizans*). Purchased.
3. 1 Klipspringer (*Oreotragus saltator*), ♂. From N.E. Africa. Presented by Commander Alfred Paget, R.N. See P. Z. S. 1896, p. 303.
1 Malaccan Parrakeet (*Palæornis longicauda*), ♂. Received in Exchange.
1 Crested Grebe (*Podiceps cristatus*). Purchased.
1 Gould's Monitor (*Varanus gouldi*). Presented by R. H. W. Leach, Esq.
4. 1 Indian Wolf (*Canis pallipes*), ♂. Presented by Duncan Darroch, Esq., 93rd Highlanders.
1 Barn-Owl (*Strix flammea*). Presented by Bernard R. White, Esq., F.Z.S.
1 Curlew (*Numenius arquata*). Purchased.
5. 1 Rufous Rat-Kangaroo (*Æpyprymnus rufescens*), 2 ♂. Born in the Menagerie.
1 Sharp-nosed Crocodile (*Crocodilus americanus*). Presented by Arthur P. Cohen, Esq.
6. 1 West-African Love-bird (*Agapornis pullaria*), ♂. Presented by Mrs. Roberts.
7. 1 Alpine Marmot (*Arctomys marmotta*). Deposited.
10. 4 Japanese Teal (*Querquedula formosa*), 2 ♂, 2 ♀. Purchased.
1 Common Viper (*Vipera berus*). Presented by Mr. S. Ockenden.
11. 2 Smews (*Mergus albellus*), 2 ♂. Purchased.
1 Purplish Death-Adder (*Pseudechis porphyriacus*). Deposited.
1 Punctulated Tree-Snake (*Dendrophis punctulatus*). Deposited.
12. 1 Hybrid Pleasant Antelope (between *Tragelaphus gratus*, ♂, and *Tragelaphus spekii*, ♀). Born in the Menagerie. See P. Z. S. 1896, p. 304.

Feb. 15. 1 Black Lark (*Melanocorypha yeltoniensis*). Purchased.
17. 1 Wood-Lark (*Alauda arborea*). Presented by J. Young, Esq., F.Z.S.
1 Whinchat (*Pratincola rubetra*). Presented by J. Young, Esq., F.Z.S.
18. 1 Common Squirrel (*Sciurus vulgaris*). Presented by Mrs. Herbert Morris.
1 Black Tanager (*Tachyphonus melaleucus*), ♀. Presented by Madame Caté.
19. 1 Rhinoceros Hornbill (*Buceros rhinoceros*), ♂. Deposited.
2 Common Pheasants (*Phasianus colchicus*), 2 ♀. Purchased.
1 Long-eared Owl (*Asio otus*). Purchased.
20. 2 Black-necked Stilt Plovers (*Himantopus nigricollis*). Purchased.
21. 1 Lion (*Felis leo*), ♂. Presented by Rowland Ward, Esq., F.Z.S.
25. 1 Vulpine Phalanger (*Trichosurus vulpecula*), ♀. Presented by Messrs. Multon and Wallis.
2 Spiny-tailed Mastigures (*Uromastix acanthinurus*). Presented by Lord Lilford, F.Z.S.
26. 1 Spiny-tailed Mastigure (*Uromastix acanthinurus*). Deposited.
1 Greater Spotted Woodpecker (*Dendrocopus major*). Presented by W. H. St. Quintin, Esq., F.Z.S.
1 Rusty Urubitinga Hawk (*Urubitinga meridionalis*). Purchased.
1 Collarless Pheasant (*Phasianus decollatus*), ♂. Deposited.
27. 3 Punjab Wild Sheep or Urials (*Ovis vignei*), 1 ♂, 2 ♀. Presented by Capt. R. A. Ogilby, D.L., F.Z.S.
1 Fraser's Eagle-Owl (*Bubo poensis*). From Ashanti. Presented by Major H. M. Sinclair, R.E.
1 Peregrine Falcon (*Falco peregrinus*). Purchased.
28. 1 Canada Goose (*Bernicla canadensis*), ♂. Received in Exchange.

Mar. 2. 2 Black Swans (*Cygnus atratus*), ♂ ♀. Purchased.
1 Eland (*Orias canna*), ♂. Born in the Menagerie.
3. 1 Hairy Armadillo (*Dasypus villosus*). Presented by A. H. Robinson, Esq.
1 Lesser Kestrel (*Tinnunculus cenchris*). Presented by Mr. A. J. Leith.
1 Puff-Adder (*Bitis arietans*). Presented by J. E. Matcham, Esq.
1 Hoary Snake (*Pseudaspis cana*). Presented by J. E. Matcham, Esq.
4. 2 Fennec Foxes (*Canis cerdo*). Presented by Dixon Bey.
1 Pale Genet (*Genetta senegalensis*). Presented by W. H. Boyle, Esq.
2 Home's Cinixys (*Cinixys homeana*). Presented by W. H. Boyle, Esq.
1 Eroded Cinixys (*Cinixys erosa*). Presented by W. H. Boyle, Esq.
1 Delalande's Gecko (*Tarentola delalandii*). Presented by W. H. Boyle, Esq.
1 Great Black-backed Gull (*Larus marinus*). Presented by Mr. G. Smith.
4 Shielded Death-Adders (*Notechis scutatus*). Deposited.
5. 1 Slender-billed Cockatoo (*Licmetis nasica*). Presented by John J. Sapp, Esq., J.P.

Mar. 6. 1 Gorilla (*Anthropopithecus gorilla*), ♀. From French Congo-land. Purchased. See P. Z. S. 1896, p. 505.
7. 1 Laughing Kingfisher (*Dacelo gigantea*). Presented by Mrs. Hillier.
1 Hawfinch (*Coccothraustes vulgaris*). Presented by C. Bates, Esq.
9. 1 Maguari Stork (*Dissura maguari*). Purchased.
1 Guira Cuckoo (*Guira piririgua*). Purchased.
1 Burrowing-Owl (*Speotyto cunicularia*). Purchased.
1 Brown Milvago (*Milvago chimango*). Purchased.
1 Ruff (*Machetes pugnax*). Purchased.
10. 1 Northern Lynx (*Felis lynx*), ♂. From Ladakh, Cashmere. Presented by F. W. H. Walshe, Esq., Lt. R.A.
1 Common Boa (*Boa constrictor*). Purchased.
11. 1 Campbell's Monkey (*Cercopithecus campbelli*), ♂. Presented by Miss Lilian Frost.
2 Black-backed Jackals (*Canis mesomelas*). Presented by J. E. Matcham, Esq.
1 Puff-Adder (*Bitis arietans*). Presented by J. E. Matcham, Esq.
1 Condor (*Sarcorhamphus gryphus*), ♀. Deposited.
6 Mexican Quails (*Callipepla squamata*). Purchased.
12. 3 Scarlet Ibises (*Eudocimus ruber*). Purchased.
2 Scarlet Tanagers (*Ramphocœlus brasilius*), ♂. Purchased.
13. 2 Redshanks (*Totanus calidris*). Purchased.
1 Algerian Tortoise (*Testudo ibera*). Presented by Mrs. Powell.
14. 1 White-crowned Mangabey (*Cercocebus æthiops*), ♂. Deposited.
1 Guillemot (*Lomvia troile*). Presented by J. L. Palmer, Esq.
16. 1 American Tapir (*Tapirus americanus*), ♂. Presented by Basil J. Freeland, Esq.
18. 1 Markhoor (*Capra megaceros*), ♂. From Peshawar. Presented by Col. Paterson. See P. Z. S. 1896, p. 506.
2 Amherst's Pheasants (*Thaumalea amherstiæ*), 2 ♀. Received in Exchange.
2 Swinhoe's Pheasants (*Euplocamus swinhoii*), ♂ ♀. Purchased.
1 Bar-tailed Pheasant (*Phasianus reevesi*), ♀. Purchased.
1 Hybrid Japanese Pheasant (*Phasianus versicolor* × *P. colchicus*), ♀. Purchased.
19. 2 Great American Egrets (*Ardea egretta*). Purchased.
1 Porto Rico Pigeon (*Columba corensis*). Purchased.
1 Vinaceous Pigeon (*Columba vinacea*). Purchased.
3 Canarian Laurel Pigeons (*Columba laurivora*). Presented by E. G. B. Meade-Waldo, Esq., F.Z.S.
20. 1 Diana Monkey (*Cercopithecus diana*), ♂. Presented by Capt. Edgar E. Bernard, A.S.C.
2 Grey Ichneumons (*Herpestes griseus*). Deposited.
2 Rosy Parrakeets (*Palæornis rosa*), ♂ ♀. Purchased.
1 Common Mynah (*Acridotheres tristis*). Presented by Mrs. Sibyl E. Kennedy.
21. 2 Barbary Wild Sheep (*Ovis tragelaphus*), ♂ ♀. Born in the Menagerie.
1 Herring-Gull (*Larus argentatus*). Presented by Dr. E. Goddard.
2 Musky Lorikeets (*Glossopsittacus concinnus*), ♂ ♀. Purchased.
23. 2 Crowned Duiker-boks (*Cephalophus coronatus*), ♂ ♀. Received in Exchange. See P. Z. S. 1896, p. 506.

Mar. 23. 1 Silver-backed Fox (*Canis chama*). Presented by C. W. Southey, Esq. See P. Z. S. 1896, p. 506.
26. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by S. C. Fisher, Esq.
27. 1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by Miss E. S. Young.
31. 2 Elliot's Pheasants (*Phasianus ellioti*), ♂ ♀. Purchased.
2 Bar-tailed Pheasants (*Phasianus reevesi*), ♂ ♀. Purchased.

April 1. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Mr. Harmer.
2. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by C. Trevelyan Winson, Esq.
1 Raccoon-like Dog (*Canis procynides*). Purchased.
2 Rosy-billed Ducks (*Metopiana peposaca*), 2 ♂. Purchased.
3. 1 Moustache Monkey (*Cercopithecus cephus*), ♂. Presented by Mrs. Polini.
1 Barnard's Parrakeet (*Platycercus barnardi*). Deposited.
1 Antillean Boa (*Boa diviniloqua*). From Dominica. Presented by W. Weldon Symington, Esq.
6. 1 Red-and-Yellow Macaw (*Ara chloroptera*). Presented by Eugene E. G. Jones, Esq.
7. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Owen L. Hancock, Esq.
2 Red-beaked Weaver-birds (*Quelea sanguinirostris*). Deposited.
1 Java Sparrow (*Padda oryzivora*). Deposited.
1 Goldfinch (*Carduelis elegans*). Deposited.
1 Rose-breasted Grosbeak (*Hedymeles ludovicianus*). Deposited.
1 Lesser Black-backed Gull (*Larus fuscus*). Deposited.
10. 1 Indian Elephant (*Elephas indicus*), ♂. Purchased. See P. Z. S. 1896, p. 547.
11. 1 Tigrine Cat (*Felis tigrina*). Purchased.
1 Dusky Duck (*Anas obscura*?), ♀. Presented by W. H. St. Quintin, Esq., F.Z.S.
13. 4 North-African Jackals (*Canis anthus*). Born in the Menagerie.
14. 1 Red-faced Ouakari (*Ouacaria rubicunda*). Presented by Ernest E. Austen, Esq.
2 Maholi Galagos (*Galago maholi*). Born in the Menagerie.
15. 1 Nankeen Night-Heron (*Nycticorax caledonicus*). Purchased.
16. 1 Black-eared Marmoset (*Hapale penicillata*). Presented by R. H. Biddell, Esq.
1 Common Marmoset (*Hapale jacchus*). Presented by R. H. Biddell, Esq.
1 Indian Civet (*Viverricula malaccensis*). Purchased.
17. 1 Weka Rail (*Ocydromus australis*). Received in Exchange.
20 Midwife Toads (*Alytes obstetricans*). From Westphalia. Purchased.
18. 1 Lion (*Felis leo*), ♂. Deposited.
1 Ring-tailed Coati (*Nasua rufa*). Presented by Capt. Hyde.
1 Ring-tailed Coati (*Nasua rufa*). Presented by James Green, Esq.
21. 1 Natal Python (*Python sebæ natalensis*). Presented by J. E. Matcham, Esq., C.M.Z.S.
5 Hoary Snakes (*Pseudaspis cana*). Presented by J. E. Matcham, Esq., C.M.Z.S.

Apr. 21. 1 Rhomb-marked Snake (*Trimerorhinus rhombeatus*). Presented by J. E. Matcham, Esq., C.M.Z.S.
1 Cape Bucephalus (*Dispholidus typus*). Presented by J. E. Matcham, Esq., C.M.Z.S.
5 Puff-Adders (*Bitis arietans*). Presented by J. E. Matcham, Esq., C.M.Z.S.
22. 1 Egyptian Jerboa (*Dipus ægyptius*). Presented by F. J. Pringuer, Esq.
2 Common Sheldrakes (*Tadorna cornuta*). Purchased.
23. 3 Red Kangaroos (*Macropus rufus*), 2 ♂, 1 ♀. Deposited.
4 Black Wallaroos (*Macropus robustus*), 4 ♂. Deposited.
25. 1 Brown Mouse Lemur (*Chirogaleus milii*?). Deposited.
1 Polecat (*Mustela putorius*). Presented by F. D. Lea Smith, Esq.
1 Alexandra Parrakeet (*Polytelis alexandræ*). Presented by W. Pritchard Morgan, Esq., M.P.
1 Alexandra Parrakeet (*Polytelis alexandræ*), ♂. Deposited.
1 Hamadryad (*Naia bungarus*). Deposited.
27. 1 Fennec Fox (*Canis cerdo*). Presented by J. G. Mackie, Esq.
1 Great Wallaroo (*Macropus robustus*), ♀. Deposited.
28. 1 Brahminy Kite (*Haliastur indus*). Presented by A. Kemmis-Betty, Esq.
5 Meyer's Parrots (*Pæocephalus meyeri*). Deposited.
1 Brown-throated Conure (*Conurus æruginosus*). Deposited.
2 Alario Sparrows (*Passer alario*). Deposited.
2 Brazilian Tortoises (*Testudo tabulata*). Deposited.
29. 1 Lace Monitor (*Varanus varius*). Deposited.
1 Blue-tongued Lizard (*Tiliqua scincoides*). Deposited.
30. 1 Chimpanzee (*Anthropopithecus troglodytes*), ♀. Purchased.
1 Canadian Skunk (*Mephitis mephitica*). From Mexico. Presented by Henry Heath Cochrane, Esq.

May 1. 1 Gould's Fruit-Bat (*Pteropus gouldi*). Purchased. See P.Z.S. 1896, p. 608.
1 Short-nosed Bandicoot (*Perameles obesula*), ♀. Purchased.
2 Spotted Tinnamous (*Nothura maculosa*). Purchased.
2. 1 Rhesus Monkey (*Macacus rhesus*), ♂. Presented by Mr. E. Turnham.
1 Canary Finch (*Serinus canarius*). Presented by H. B. Hewetson, Esq., F.Z.S.
1 African Tantalus (*Tantalus ibis*). Presented by Capt. Dugmore.
1 Leopard Tortoise (*Testudo pardalis*). Presented by Capt. Dugmore.
4. 2 West-Indian Agoutis (*Dasyprocta cristata*). Presented by W. Weldon Symington, Esq.
2 Blue-headed Pigeons (*Starnœnas cyanocephala*). Purchased.
2 Auriculated Doves (*Zenaida auriculata*), ♂ ♀. Purchased.
2 Picui Doves (*Columbula picui*), ♂ ♀. Purchased.
4 Cape Doves (*Œna capensis*), 2 ♂, 2 ♀. Purchased.
5. 3 (Young) Cheetahs (*Cynælurus jubatus*). From Somaliland. Presented by Kenneth Foster, Esq.
1 Spotted Ichneumon (*Herpestes auro-punctatus*). Deposited.
2 Crowned Pigeons (*Goura coronata*). Purchased.
1 Chinese Goose (*Anser cygnoides*), ♂. Presented by L. G. Leverson, Esq., F.Z.S.

May 5. 1 Porose Crocodile (*Crocodilus porosus*). Presented by A. W. Richmond, Esq.

6. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by F. Greswolde-Williams, Esq.

1 Southern Fruit-Pigeon (*Crocopus chlorogaster*). Purchased.

7. 1 Brown Capuchin (*Cebus fatuellus*). Presented by Mrs. J. Hicks.

2 Hamadryads (*Naia bungarus*). Purchased.

8. 1 Great Anteater (*Myrmecophaga jubata*). Purchased.

1 White-crested Cockatoo (*Cacatua alba*). Presented by Mrs. Crofts.

2 Pennant's Parrakeets (*Platycercus pennanti*). Presented by Clifford Brooks, Esq.

1 Nicobar Pigeon (*Calœnas nicobarica*). Purchased.

9. 1 Entellus Monkey (*Semnopithecus entellus*). Purchased.

2 Sambur Deer (*Cervus aristotelis*), 2 ♂. Presented by F. Greswolde-Williams, Esq.

2 Bennett's Wallabies (*Macropus bennetti*), ♂ ♀. Deposited.

12. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by F. Greswolde-Williams, Esq.

8 Esquimaux Dogs (*Canis familiaris*). Deposited.

1 Common Viper (*Vipera berus*). Presented by H. L. C. Barret, Esq.

13. 1 Lesser Kestrel (*Tinnunculus cenchris*). Presented by Miss M. J. L. Spaull.

2 Barbary Wild Sheep (*Ovis tragelaphus*). Born in the Menagerie.

14. 1 Red-fronted Lemur (*Lemur rufifrons*), ♂. Presented by E. A. Pardoe, Esq.

15. 2 Undulated Grass-Parakeets (*Melopsittacus undulatus*), ♂ ♀. Purchased.

1 Grison (*Galictis vittata*, jr.). Presented by J. J. Quelch, Esq., C.M.Z.S.

2 Brazilian Tortoises (*Testudo tabulata*). Presented by J. J. Quelch, Esq., C.M.Z.S.

2 Scorpion Mud-Terrapins (*Cinosternon scorpioides*). Presented by J. J. Quelch, Esq., C.M.Z.S.

1 Rough Terrapin (*Nicoria punctularia*). Presented by J. J. Quelch, Esq., C.M.Z.S.

16. 1 Pied Crow Shrike (*Strepera graculina*). Purchased.

2 Whooper Swans (*Cygnus musicus*). Purchased.

1 Natal Python (*Python sebæ natalensis*). Presented by W. Champion, Esq.

1 Ring-hals Snake (*Sepedon hæmachates*). Presented by W. Champion, Esq.

18. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by Sir William Call.

1 Blue-bearded Jay (*Cyanocorax cyanopogon*). Presented by Capt. H. C. T. Beadnell, F.Z.S.

4 Puff-Adders (*Bitis arietans*). Presented by J. E. Matcham, Esq., C.M.Z.S.

2 Ring-hals Snakes (*Sepedon hæmachates*). Presented by J. E. Matcham, Esq., C.M.Z.S.

1 Yellow Cobra (*Naia flava*). From Port Elizabeth. Presented by J. E. Matcham, Esq., C.M.Z.S.

3 Cape Vipers (*Causus rhombeatus*). Presented by J. E. Matcham, Esq., C.M.Z.S.

May 18. 1 Cape Bucephalus (*Diopholidus typus*). Presented by J. E. Matcham, Esq., C.M.Z.S.
2 Infernal Snakes (*Boodon infernalis*). Presented by J. E. Matcham, Esq., C.M.Z.S.
19. 1 Grey Ichneumon (*Herpestes griseus*). Deposited.
20. 1 Japanese Deer (*Cervus sika*), ♂. Born in the Menagerie.
23. 1 Nilotic Monitor (*Varanus niloticus*). Presented by J. E. Matcham, Esq., C.M.Z.S.
2 Indian Tree-Ducks (*Dendrocygna javanica*). Purchased.
25. 1 Ash-coloured Falcon (*Falco concolor*), ♂. Purchased.
1 Large-billed Hawk (*Asturina magnirostris*). Purchased.
26. 1 Marsh-Deer (*Cariacus paludosus*), ♂. Deposited.
1 Common Otter (*Lutra vulgaris*, jr.). Presented by Henry Laver, Esq.
4 Gouldian Grass-Finches (*Poëphila gouldiæ*), 2♂, 2♀. Purchased.
2 Crimson Finches (*Estrelda phaëton*). Purchased.
4 Daudin's Tortoises (*Testudo daudini*). Deposited. See P. Z. S. 1896, p. 608.
27. 1 Caracal (*Felis caracal*). Presented by Capt. E. F. Carter.
2 Green-winged Doves (*Chalcophaps indica*). Purchased.
2 White-backed Pigeons (*Columba leuconota*). Purchased.
4 Alligators (*Alligator mississippiensis*). Deposited.
28. 1 Sœmmerring's Gazelle (*Gazella sœmmerringi*), ♂. Received in Exchange.
2 Striped Hyænas (*Hyæna striata*). Received in Exchange.
1 Egyptian Ichneumon (*Herpestes ichneumon*). Received in Exchange.
2 Libyan Zorillas (*Ictonyx lybica*). Received in Exchange.
2 Fennec Foxes (*Canis cerdo*). Received in Exchange.
2 Rüppell's Vultures (*Gyps rueppelli*). Received in Exchange. See P. Z. S. 1896, p. 609.
4 Egyptian Vultures (*Neophron percnopterus*). Received in Exchange.
1 Spotted Cavy (*Cœlogenys paca*). Presented by Dr. F. G. C. Damian.
2 Thick-tailed Opossums (*Didelphys crassicaudata*). Purchased.
1 Blue-and-Yellow Macaw (*Ara ararauna*). Presented by Mrs. Browning.
29. 7 Shovellers (*Spatula clypeata*), 3 ♂, 4 ♀. Purchased.
4 Golden-eyes (*Clangula glaucion*), 2 ♂, 2 ♀. Purchased.
6 Common Teal (*Querquedula crecca*), 6 ♀. Purchased.
1 Anomalous Snake (*Rhadinæa anomala*). Purchased.
1 Adorned Ceratophrys (*Ceratophrys ornata*). Purchased.
30. 2 Brown-throated Conures (*Conurus æruginosus*). Presented by Mrs. Harry Blades.
1 Yellow Tree-Boa (*Epicrates inornatus*). Presented by J. J. Bowrey, Esq.
31. 1 Japanese Deer (*Cervus sika*), ♂. Born in the Menagerie.

June 1. 1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by Mrs. Bouverie.
2 Natal Pythons (*Python sebæ natalensis*). Deposited.
2. 2 Slow Lorises (*Nycticebus tardigradus*). Presented by Stanley S. Flower, Esq.
1 Roseate Cockatoo (*Cacatua roseicapilla*). Presented by Stanley S. Flower, Esq.

June 2. 1 Lesser Sulphur-crested Cockatoo (*Cacatua sulphurea*). Presented by Stanley S. Flower, Esq.
2 Spinose Land-Emys (*Geoemyda spinosa*). Presented by Stanley S. Flower, Esq.
1 Black-spotted Toad (*Bufo melanostictus*). Presented by Stanley S. Flower, Esq.
1 Rough Toad (*Bufo asper*). Presented by Stanley S. Flower, Esq.
3. 1 Japanese Deer (*Cervus sika*), ♂. Born in the Menagerie.
4. 2 Hairy Armadillos (*Dasypus villosus*), ♂ ♀. Presented by Messrs. FitzHerbert, Bros.
1 Leopard Tortoise (*Testudo pardalis*). Deposited.
1 Cunningham's Skink (*Egernia cunninghami*). Deposited.
5. 2 Thars (*Capra jemlaica*), 2 ♀. Born in the Menagerie.
1 Huanaco (*Lama huanacos*), ♂. Born in the Menagerie.
6. 1 Javan Porcupine (white variety) (*Hystrix javanica*). Deposited.
1 Coati (*Nasua rufa*). Presented by Ernest Brocklehurst, Esq.
2 Herring-Gulls (*Larus argentatus*). Presented by Baron Ferdinand de Rothschild.
2 Black-headed Gulls (*Larus ridibundus*). Presented by Baron Ferdinand de Rothschild.
7. 1 Red Deer (*Cervus elaphus*), ♀. Born in the Menagerie.
8. 1 Short-toed Eagle (*Circaëtus gallicus*). Presented by Dixon Bey.
9. 1 Harnessed Antelope (*Tragelaphus scriptus*), ♂. Deposited.
2 Fat Dormice (*Myoxus glis*). Presented by John G. Haggard, Esq.
2 Short-eared Owls (*Asio brachyotus*). Presented by Capt. R. A. Ogilby, F.Z.S.
10. 3 Dwarf Chameleons (*Chamæleon pumilus*). Presented by Miss Jessie M. Hudson.
11. 1 Vulturine Eagle (*Aquila verreauxi*). Presented by J. Clark, Esq.
2 Green Turtles (*Chelone viridis*). Presented by Capt. J. G. Jones.
1 Green Turtle (*Chelone viridis*). Presented by Mr. G. K. Candy.
12. 6 Upland Geese (*Chloephaga magellanica*). Bred in the Menagerie.
8 Natterjack Toads (*Bufo calamita*). Presented by Stanley S. Flower, Esq.
2 Common Toads (*Bufo vulgaris*). Presented by Stanley S. Flower, Esq.
13. 1 Hoolock Gibbon (*Hylobates hoolock*), ♀. Presented by Mrs. Firman.
1 Hoolock Gibbon (*Hylobates hoolock*), ♀. Deposited.
2 Indian Drongos (*Chibia hottentota*). Deposited.
1 Indian Chevrotain (*Tragulus meminna*). Presented by the Hon. Sidney Parker.
1 Javan Chevrotain (*Tragulus javanica*). Presented by the Hon. Sidney Parker.
2 Tigers (*Felis tigris*), ♂ ♀. Purchased.
14. 5 Shags (*Phalacrocorax graculus*, jr.). Presented by the Maclaine of Lochbuie.
9 Green Turtles (*Chelone viridis*). Presented by J. C. Adlam, Esq.

June 14. 2 Axolotls (*Amblystoma tigrinum*). Presented by W. Temple, Esq.
15. 1 Crab-eating Raccoon (*Procyon cancrivorus*). Deposited.
1 Australian Fruit-Bat (*Pteropus poliocephalus*). Purchased.
16. 1 Vervet Monkey (*Cercopithecus lalandii*), ♂. Presented by Mr. Vernon E. Barrett.
1 Mona Monkey (*Cercopithecus mona*), ♀. Deposited.
1 Black-headed Conure (*Conurus nanday*). Presented by Mrs. Baird.
2 Common Peafowl (*Pavo cristatus*) (albinos), ♂ ♀. Presented by F. A. Noyce, Esq.
17. 1 Burrhel Wild Sheep (*Ovis burrhel*), ♀. Born in the Menagerie.
2 West-African Love-birds (*Agapornis pullaria*). Deposited.
18. 1 Thar (*Capra jemlaica*), ♀. Born in the Menagerie.
1 Ring-necked Parrakeet (*Palæornis torquatus*), ♂. Presented by Miss Smith.
20. 2 Golden Eagles (*Aquila chrysaëtus*). Presented by the Maclaine of Lochbuie.
2 Peregrine Falcons (*Falco peregrinus*, jr.). Presented by the Maclaine of Lochbuie.
2 Wood-Owls (*Syrnium aluco*). Presented by A. Farquhar Wilson, Esq.
1 Short-eared Owl (*Asio brachyotus*). Presented by A. Farquhar Wilson, Esq.
1 Black-eared Marmoset (*Hapale penicillata*). Presented by S. Osborn, Esq.
22. 1 Brush-tailed Kangaroo (*Petrogale penicillata*). Born in the Menagerie.
2 Spotted Pigeons (*Columba maculosa*). Bred in the Menagerie.
2 Triangular-spotted Pigeons (*Columba guinea*). Bred in the Menagerie.
2 Vinaceous Turtle-Doves (*Turtur vinaceus*). Bred in the Menagerie.
1 Japanese Greenfinch (*Chloris kawarahibi*). Bred in the Menagerie.
23. 1 Peba Armadillo (*Tatusia peba*). Deposited.
1 Maximilian's Terrapin (*Hydromedusa maximiliana*). Deposited.
24. 1 Occipital Vulture (*Vultur occipitalis*). Purchased. See P. Z. S. 1896, p. 780.
2 Burmeister's Cariamas (*Chunga burmeisteri*). Purchased.
2 Crowned Partridges (*Rollulus cristatus*). Purchased.
2 Chilian Teal (*Querquedula creccoides*). Purchased.
12 Spotted Tinamous (*Nothura maculosa*). Purchased.
8 Bell's Cinixys (*Cinixys belliana*). Deposited.
1 Madagascar Boa (*Boa madagascariensis*). Deposited.
1 Madagascar Tree-Boa (*Corallus madagascariensis*). Deposited.
3 Indian Stock-Doves (*Columba eversmanni*). Presented by Frank Finn, Esq., F.Z.S.
1 Baer's Duck (*Fuligula baeri*). Presented by Frank Finn, Esq., F.Z.S. See P. Z. S. 1896, p. 780.
3 Dussumier's Hemipodes (*Turnix dussumieri*). Presented by Frank Finn, Esq., F.Z.S.
25. 2 Plaintain Squirrels (*Sciurus plantani*). Purchased.
2 Schamas (*Cittocincla macrura*). Purchased.
1 Malabar Green Bulbul (*Phyllornis aurifrons*). Purchased.
1 Schokari Sand-Snake (*Psammophis schokari*). Purchased.

June 25. 2 Hissing Sand-Snakes (*Psammophis sibilans*). Purchased.
28. 1 Common Squirrel (*Sciurus vulgaris*). Presented by Mr. H. Morris.
29. 1 Temminck's Pangolin (*Manis temminckii*). Deposited. See P. Z. S. 1896, p. 780.
30. 2 Ostriches (*Struthio camelus*), ♂ ♀. Deposited.
2 Hamadryads (*Naia bungarus*). Deposited.
2 Indian Pythons (*Python molurus*). Deposited.
2 Spotted Salamanders (*Salamandra maculosa*). Presented by Philip Gosse, Esq.

July 1. 3 Clouded Iguanas (*Cyclura carinata*). Deposited.
2 Pratincoles (*Glareola pratincola*). Bred in the Gardens.
2 Red Ground-Doves (*Geotrygon montana*). Deposited.
1 Blood-breasted Pigeon (*Phlogœnas cruentata*). Deposited.
2. 1 Black-headed Gull (*Larus ridibundus*). Presented by James Boorne, Esq.
1 Crested Pigeon (*Ocyphaps lophotes*). Purchased.
3. 1 Peregrine Falcon (*Falco peregrinus*). Presented by T. W. Hubble, Esq.
1 Collection of Sea-Anemones. Presented by Charles Moss, Esq.
1 Chimpanzee (*Anthropopithecus troglodytes*), ♂. Purchased.
4. 2 Virginian Deer (*Cariacus virginianus*), ♂ ♀. From Canada. Presented by Richard R. Dobell, Esq.
1 Blue-fronted Amazon (*Chrysotis æstiva*). Presented by A. E. Corsbie, Esq.
1 Red-bellied Squirrel (*Sciurus variegatus*). Presented by Mrs. Sheana Pullen.
1 Great-billed Rhea (*Rhea macrorhyncha*). Deposited.
6. 8 Horsfield's Tortoises (*Homopus horsfieldi*). Deposited.
2 Giant Toads (*Bufo marinus*). Deposited.
2 Glossy Ibises (*Plegadis falcinellus*). Bred in the Menagerie.
3 Common Sheldrakes (*Tadorna cornuta*), 1 ♂, 2 ♀. Purchased.
7. 1 Iceland Falcon (*Hierofalco islandus*). Deposited.
2 Lettered Aracaris (*Pteroglossus inscriptus*). Purchased. See P. Z. S. 1896, p. 780.
1 Burrhel Wild Sheep (*Ovis burrhel*). Born in the Menagerie.
8. 3 Yellow-bellied Liothrix (*Liothrix luteus*). Presented by Robert E. Graves, Esq., F.Z.S.
1 Hamster (*Cricetus frumentarius*). Presented by Miss Hilton.
9. 1 Striped Hyæna (*Hyæna striata*). Presented by C. A. Osborne, Esq. From Jedda, Arabia.
1 Diana Monkey (*Cercopithecus diana*). Presented by E. Kirby, Esq.
10. 1 Gold Pheasant (*Thaumalea picta*), ♂. Presented by R. C. G. Pollock, Esq., F.Z.S.
1 Black-necked Swan (*Cygnus nigricollis*). Purchased.
11. 1 Reticulated Python (*Python reticulatus*). Deposited.
1 Vervet Monkey (*Cercopithecus lalandii*). Presented by Henry Russell, Esq.
1 Lesser White-nosed Monkey (*Cercopithecus petaurista*). Presented by Sir Gilbert Carter.
1 White-throated Monitor (*Varanus albigularis*). Presented by Sir Gilbert Carter.
13. 1 Passerine Owl (*Glaucidium passerinum*). Presented by Miss Bloxam.

July 13. 1 Squirrel Monkey (*Chrysothrix sciurea*). Presented by Mrs Turner-Turner.
14. 7 Peruvian Snakes (*Tachymenis peruvianus*). Deposited.
9 Slender Liolems (*Liolæmus tenuis*). Deposited.
5 Gay's Frogs (*Calyptocephalus gayi*). Deposited.
6 Bibron's Frogs (*Paludicola bibroni*). Deposited.
15. 1 Eyed Lizard (*Lacerta ocellata*). Deposited.
1 Patagonian Conure (*Conurus patagonus*). Purchased.
1 Huanaco (*Lama huanacos*), ♂. Presented by J. F. Schwann, Esq.
16. 1 Tayra (*Galictis barbara*). Purchased.
1 Indian Python (*Python molurus*). Deposited.
17. 1 Brazza's Monkey (*Cercopithecus brazzæ*), ♀. Purchased. See P. Z. S. 1896, p. 780.
4 Rough-keeled Snakes (*Dasypeltis scabra*). Presented by Mr. Frederick A. Storey.
1 Lineated Boodon (*Boodon lineatus*). Presented by Mr. Frederick A. Storey.
1 Rhomb-marked Snake (*Trimerorhinus rhombeatus*). Presented by Mr. Frederick A. Storey.
1 Delalande's Lizard (*Nucras delalandii*). Presented by Mr. Frederick A. Storey.
1 Agile Wallaby (*Macropus agilis*), ♀. Purchased.
20. 1 Raven (*Corvus corax*). Presented by Wm. Soper, Esq.
21. 1 Yellow-headed Conure (*Conurus jendaya*). Deposited.
1 Boobook Owl (*Ninox boobook*). Presented by Dr. R. Broom.
22. 6 Garter Snakes (*Tropidonotus ordinatus*). Received in Exchange.
6 Dekay's Snakes (*Ischnognathus dekayi*). Received in Exchange.
3 Spotted-headed Snakes (*Ischnognathus occipitomaculatus*). Received in exchange.
3 Grass-Snakes (*Contia vernalis*). Received in exchange.
1 Hog-nosed Snake (*Heterodon platyrhinos*). Received in Exchange.
1 Green Lizard (*Lacerta viridis*). Deposited.
1 Rook (*Corvus frugilegus*). Presented by A. Greaves, Esq.
23. 1 Barbary Ape (*Macacus inuus*), ♀. Presented by E. G. Walls, Esq.
1 Bonnet-Monkey (*Macacus sinicus*), ♀. Deposited.
1 New-Zealand Parrakeet (*Cyanorhamphus novæ-zealandiæ*). Presented by Miss A. Malcolm.
1 Bare-eyed Cockatoo (*Cacatua gymnopis*). Presented by Mrs. M. E. Huntley.
24. 1 Ocelot (*Felis pardalis*). Presented by H. O. Nicholls, Esq.
2 Patagonian Cavies (*Dolichotis patachonicus*). Born in the Menagerie.
2 Ypecaha Rails (*Aramides ypecaha*). Bred in the Menagerie.
6 Purple Death-Adders (*Pseudechis porphyriacus*). Deposited.
3 Brown Death-Adders (*Diemenia textilis*). Deposited.
6 Shielded Death-Adders (*Notechis scutatus*). Deposited.
25. 2 Macaque Monkeys (*Macacus cynomolgus*), ♂ ♀. Presented by Mrs. Williamson.
1 Black-tailed Flower-bird (*Anthornis melanura*). Presented by the Hon. Walter Rothschild, F.Z.S.
27. 2 Amaduvade Finches (*Estrelda amandava*). Presented by Miss M. von Laer.

July 27. 1 Paradise Whydah-bird (*Vidua paradisea*). Presented by Miss M. von Laer.
1 Martinique Gallinule (*Ionornis martinicus*). Presented by A. W. Arrowsmith, Esq.
8 Amherst's Pheasants (*Thaumalea amherstiæ*). Bred in the Menagerie.
2 Himalayan Monauls (*Lophophorus impeyanus*). Bred in the Menagerie.
2 Peacock Pheasants (*Polyplectron chinquis*). Bred in the Menagerie.
5 European Tree-Frogs (*Hyla arborea*). Presented by G. W. Winwhite, Esq.
28. 1 Cape Viper (*Causus rhombeatus*). Presented by J. E. Matcham, Esq., C.M.Z.S.
1 Puff-Adder (*Bitis arietans*). Presented by J. E. Matcham, Esq., C.M.Z.S.
1 Cape Bucephalus (*Dispholidus typus*). Presented by J. E. Matcham, Esq., C.M.Z.S.
5 Hoary Snakes (*Pseudaspis cana*). Presented by J. E. Matcham, Esq., C.M.Z.S.
1 Ring-hals Snake (*Sepedon hæmachates*). Presented by J. E. Matcham, Esq., C.M.Z.S.
29. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by V. Lloyd, Esq.
4 Common Terns (*Sterna hirundo*). Presented by Col. Davies Cooke.
4 Midwife Toads (*Alytes obstetricans*). Presented by Prof. Gustave Gilson.
31. 1 Gentoo Penguin (*Pygosceles tæniatus*). Deposited.

Aug. 1. 1 Delalande's Lizard (*Nucras delalandii*). Presented by J. E. Matcham, Esq., C.M.Z.S.
1 Defenceless Lizard (*Agama inermis*). Presented by J. E. Matcham, Esq., C.M.Z.S.
4 Crossed Snakes (*Psammophis crucifer*). Presented by J. E. Matcham, Esq., C.M.Z.S.
6 Rufescent Snakes (*Leptodira hotambœia*). Presented by J. E. Matcham, Esq., C.M.Z.S.
3 Rough-keeled Snakes (*Dasypeltis scabra*). Presented by J. E. Matcham, Esq., C.M.Z.S.
4 Rhomb-marked Snakes (*Trimerorhinus rhombeatus*). Presented by J. E. Matcham, Esq., C.M.Z.S.
1 Spotted Salamander (*Salamandra maculosa*). Presented by Ludwig Mond, Esq., F.R.S.
2. 1 Raven (*Corvus corax*). Presented by A. H. Cullingford, Esq., F.Z.S.
3. 2 Patagonian Cavies (*Dolichotis patachonica*). Bred in the Gardens.
2 Ypecaha Rails (*Aramides ypecaha*). Bred in the Gardens.
4. 1 Brown Capuchin (*Cebus fatuellus*). Deposited.
5. 1 Black-faced Kangaroo (*Macropus melanopus*), ♂. Presented by G. T. Wills, Esq.
1 Common Cormorant (*Phalacrocorax carbo*). Presented by Miss G. Howell.
6. 2 Passerine Parrots (*Psittacula passerina*). Presented by Miss L. Scott Moncrieff.

Aug. 6. 1 Loder's Gazelle (*Gazella leptoceros*), ♀. Presented by A. R. Birdwood, Esq. From Egypt. See P. Z. S. 1896, p. 780.
1 Dorcas Gazelle (*Gazella dorcas*, jr.). Presented by Dixon Bey.
2 Hairy-footed Jerboas (*Dipus hirtipes*). Presented by Dixon Bey.
1 Spot-bellied Snake (*Zamenis ventrimaculatus*). Presented by Dixon Bey.
1 Ocellated Sand-Skink (*Seps ocellatus*). Presented by Dixon Bey.
1 Ruddy Ichneumon (*Herpestes smithi*). Deposited.
10. 1 Wapiti Deer (*Cervus canadensis*), ♀. Bred in the Gardens.
1 White-browed Amazon (*Chrysotis albifrons*). Purchased.
11. 2 Sclater's Curassows (*Crax sclateri*). Presented by E. Sumead, Esq.
1 Common Sandpiper (*Tringoides hypoleucus*). Presented by E. C. Sprawson, Esq.
13. 1 Golden Eagle (*Aquila chrysaëtus*). Presented by F. Leathly Holt, Esq.
3 Common Blue-birds (*Sialia wilsonii*). Presented by A. T. Binny, Esq.
2 Stone-Curlews (*Œdicnemus scolopax*). Presented by W. J. Kidman, Esq.
14. 4 Malabar Squirrels (*Sciurus maximus*). Presented by W. J. Stillman, Esq.
15. 2 Common Blue-birds (*Sialia wilsonii*). Presented by Percy Cockshut, Esq.
3 Common Adders (*Vipera berus*). Presented by A. Old, Esq.
3 Peruvian Snakes (*Tachymenis peruvianus*). Presented by Mr. A. E. Jamrach.
20. 1 Yak (*Poëphagus grunniens*), ♂. Born in the Menagerie.
1 Virginian Fox (*Canis virginianus*). Presented by F. A. Pellas, Esq. From Nicaragua.
2 Brush-Turkeys (*Talegalla lathami*). Purchased.
21. 4 Ocellated Sand-Skinks (*Seps ocellatus*). Bred in the Menagerie.
22. 1 Capybara (*Hydrochærus capybara*). Presented by F. W. Temperley, Esq.
1 Black-necked Grackle (*Gracupica nigricollis*). Presented by Dr. Nowell.
1 Salt-water Terrapin (young) (*Malacoclemmys terrapin*). Presented by Miss Hole.
23. 1 English Wild Cow (*Bos taurus*), var. Born in the Menagerie.
1 Wapiti Deer (*Cervus canadensis*), ♀. Born in the Menagerie.
24. 1 Squirrel Monkey (*Chrysothrix sciurea*). Presented by A. C. Gouda, Esq.
3 Ivory Gulls (*Pagophila eburnea*). From Spitzbergen. Presented by J. T. Studley, Esq. See P. Z. S. 1896, p. 781.
1 Richardson's Skua (*Stercorarius crepidatus*). From Spitzbergen. Presented by J. T. Studley, Esq.
1 Brown Mynah (*Acridotheres fuscus*). Received in Exchange.
25. 1 Red Kangaroo (*Macropus rufus*), ♀. Deposited.
2 Variegated Sheldrakes (*Tadorna variegata*), ♂ ♀. Presented by Sir Walter L. Buller, K.C.M.G., C.M.Z.S.
27. 2 Common Otters (*Lutra vulgaris*). Purchased.
1 Cassowary (*Casuarius* sp. inc.). Deposited.

Aug. 27. 2 Streaky-headed Grosbeaks (*Poliospiza gularis*). Presented by Miss Jessie Porter.
28. 1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by W. Stevens, Esq.
1 Oyster-catcher (*Himantopus ostralegus*). Presented by R. Gurney, Esq., F.Z.S.
29. 4 Cayenne Lapwings (*Vanellus cayennensis*). Purchased.
1 Squirrel Monkey (*Chrysothrix sciurea*). Deposited.
30. 1 African Wild Ass (*Equus tæniopus*), ♀. Born in the Menagerie.
1 Bordeaux Snake (*Coronella girondica*). Presented by E. A. Minchin, Esq.
1 Common Snake (*Tropidonotus natrix*, var.). Presented by E. A. Minchin, Esq.
31. 1 Mona Monkey (*Cercopithecus mona*), ♀. Presented by F. Wyville Thomson, Esq.
2 Garnett's Galagos (*Galago garnetti*). Presented by Rear-Admiral H. H. Rawson, C.B.

Sept. 1. 1 Brown Capuchin (*Cebus fatuellus*), ♀. Deposited.
1 Brown Capuchin (*Cebus fatuellus*), ♀. Presented by Miss Cissie Wade.
2. 1 Hairy-footed Fruit-Bat (*Pteropus pselaphon*). Presented by Capt. Kemp. From the Bonin Islands. See P. Z. S. 1896, p. 782.
1 Suricate (*Suricata tetradactyla*), ♀. Presented by the Rev. Wilfred Fisher.
3. 3 Painted Terrapins (*Chrysemmys picta*). Presented by Dr. A. H. Hallen.
3 American Green Frogs (*Rana halecina*). Presented by Dr. A. H. Hallen.
1 Carunculated Bell-bird (*Chasmorhynchus niveus*). Purchased.
4. 1 American Black Bear (*Ursus americanus*), ♂. Presented by Bryan Godfrey Faussett, Esq., Lieut. R.N. From Vancouver Island.
1 Llama (*Lama peruana*), ♂. Presented by the Executors of the late Col. J. T. North.
1 Alligator (young) (*Alligator mississippiensis*). Presented by Hugh Mytton, Esq.
5. 1 Long-tailed Glossy Starling (*Lamprotornis æneus*). Purchased.
2 Yellow-backed Whydah-birds (*Coliopasser macrurus*), ♂ ♀. Purchased.
1 Algerian Tortoise (*Testudo ibera*). Presented by Mrs. Fraser.
1 Common Chameleon (*Chamæleon vulgaris*). Presented by Mrs. Fraser.
8. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by Mr. John Hart.
1 Red Deer (*Cervus elaphus*), ♀. Received in Exchange.
1 Egyptian Jerboa (*Dipus ægyptius*). Deposited.
2 Lanner Falcons (*Falco lanarius*). Presented by W. Glynes Bruty, Esq.
1 Glaucous Gull (*Larus glaucus*). Presented by the Jackson-Harmsworth Polar Expedition.
9. 1 Diana Monkey (*Cercopithecus diana*), ♀. Purchased.
1 Rhesus Monkey (*Macacus rhesus*), ♀. Presented by Mr. Frederick Tomlin.

Sept. 10. 3 Capoeira Partridges (*Odontophorus dentatus*), 1 ♂, 2 ♀. Purchased.
1 Raven (*Corvus corax*). Presented by O. L. Pegler, Esq.
1 Bonnet-Monkey (*Macacus sinicus*), ♀. Presented by E. E. Hodgkins, Esq.
11. 2 Triangular-spotted Pigeons (*Columba guinea*). Bred in the Menagerie.
1 White-backed Pigeon (*Columba leuconota*). Bred in the Menagerie.
2 Half-collared Doves (*Turtur semitorquatus*). Bred in the Menagerie.
12. 1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♂. Presented by A. C. Jackson, Esq.
1 Rat-tailed Serpent or Fer-de-Lance (*Lachesis lanceolatus*). Presented by Thomas J. Mann, Esq. From St. Lucia, W.I.
14. 1 Rhesus Monkey, ♂ (*Macacus rhesus*). Presented by Mr. W. J. Drake.
2 Brown Capuchins (*Cebus fatuellus*). Presented by Walter J. Hammond, Esq.
1 Lioness (*Felis leo*). Presented by C. A. Osborne, Esq.
2 Pumas (*Felis concolor*). Born in the Menagerie.
2 Salt-water Terrapins (*Malacoclemmys terrapin*). Presented by Master and Miss Wilcox.
1 Spotted Cavy (*Cœlogenys paca*). Purchased.
15. 1 Chacma Baboon (*Cynocephalus porcarius*), ♀. Presented by Herbert Blair, Esq.
1 Two-wattled Cassowary (*Casuarius bicarunculatus*). Deposited.
16. 1 White-crowned Mangabey (*Cercocebus æthiops*), ♂. Presented by Capt. B. Parmeter.
1 Diana Monkey (*Cercopithecus diana*), ♀. Presented by Capt. B. Parmeter.
1 Common Hare (albino) (*Lepus europæus*). Deposited.
1 Common Chameleon (*Chamæleon vulgaris*). Presented by Mr. F. W. Roberts.
17. 1 Naked-throated Bell-bird (*Chasmorhynchus nudicollis*). Purchased.
1 Nightingale (*Daulias luscinia*), ♂. Purchased.
1 Tawny Owl (*Syrnium aluco*). Presented by C. A. Lowes, Esq.
2 Dwarf Chameleons (*Chamæleon pumilus*). Presented by Mrs. Robinson.
18. 1 Levaillant's Cynictis (*Cynictis penicillata*). Deposited.
4 Common Quails (*Coturnix communis*). Presented by J. Rooney, Esq.
19. 1 Black-headed Lemur (*Lemur brunneus*), ♂. Presented by T. Cubitt, Esq.
1 Chacma Baboon (*Cynocephalus porcarius*), ♀. Presented by Mrs. Matcham.
3 Western Chipping Squirrels (*Tamias asiaticus*). Presented by Alfred E. Speer, Esq., F.Z.S.
1 Viverrine Cat (*Felis viverrina*). Purchased.
1 White-crested Touracou (*Turacus corythaix*). Presented by Gambier Bolton, Esq., F.Z.S.
1 Little Grebe (*Tachybaptes fluviatilis*). Presented by Mr. Howard Bunn.
1 Ariel Toucan (*Rhamphastos uriel*). Purchased.
3 Maguari Storks (*Dissura maguari*). Deposited.

Sept. 21. 1 Ring-tailed Coati (*Nasua rufa*). Presented by Mis Madeline E. Clarke.
1 Orange-cheeked Amazon (*Chrysotis autumnalis*). Presented by Mr. Baratti.
22. 2 Bonnet-Monkeys (*Macacus sinicus*), 2 ♀. Presented by Mrs. Strutt.
1 Short-tailed Wallaby (*Macropus brachyurus*). Deposited.
1 Common Heron (*Ardea cinerea*). Presented by E. J. Poyser, Esq., F.Z.S.
1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by J. Laverack, Esq.
23. 1 Red-footed Squirrel (*Sciurus pyrrhopus*). From Monrovia. Presented by Ellis Edwards, Esq. See P. Z. S. 1896, p. 782.
6 Rough Terrapins (*Nicoria punctularia*). Presented by Dr. E. A. Goeldi, C.M.Z.S.
1 African Lepidosiren (*Lepidosiren annectens*). Received in Exchange.
24. 4 Montagu's Harriers (*Circus cineraceus*, juv.). Presented by W. J. Laidlay, Esq.
3 Black-bellied Sand-Grouse (*Pterocles arenarius*). Presented by G. P. Torrens, Esq. From Spain.
26. 2 Ruffs (*Machetes pugnax*), ♂ ♀. Purchased.
28. 1 Masked Paradoxure (*Paradoxurus larvatus*). From China. Presented by J. D. De La Touche, Esq.
1 Levaillant's Amazon (*Chrysotis levaillanti*). Purchased.
7 Pratincoles (*Glareola pratincola*). Deposited.
29. 1 Pin-tailed Monkey (*Macacus nemestrinus*), ♀. Presented by Mr. Edward Good.
1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by Mr. Edward Good.
1 Ethiopian Hedgehog (*Erinaceus æthiopicus*). Presented by J. U. Coxen, Esq. From the Erkomit Hills, E. Soudan.
1 Long-tailed Glossy Starling (*Lamprotornis æneus*). Purchased.
3 Common Chameleons (*Chamæleon vulgaris*). Presented by Mr. E. Palmer.
30. 1 King Parrot (*Aprosmictus scapulatus*), ♂. Presented by Mrs. Lyons.
1 Australian Wild Duck (*Anas superciliosa*). Bred in the Menagerie.
4 Mandarin Ducks (*Æx galericulata*). Bred in the Menagerie.
1 Rosy-billed Duck (*Metopiana peposaca*). Bred in the Menagerie.
2 Algerian Tortoises (*Testudo ibera*). Presented by A. J. Aitchison, Esq., F.Z.S.

Oct. 1. 1 Patas Monkey (*Cercopithecus patas*), ♀. Presented by W. S. Gilbert, Esq.
1 Great Kangaroo (*Macropus giganteus*), ♂. Born in the Menagerie.
1 Yarrell's Curassow (*Crax carunculata*), ♂. Purchased.
1 Black Francolin (*Francolinus vulgaris*), ♂. Presented by Admiral Sir M. Culme-Seymour, Bt., K.C.B.
2 Brazilian Tortoises (*Testudo tabulata*). Presented by Thomas Otway, Esq. From Grenada, W. I.
1 Kite (*Milvus ictinus*). Presented by E. A. Wilson, Esq.

Oct. 1. 1 Asiatic Wild Ass (*Equus onager*), ♀. Born in the Menagerie.
1 Red-fronted Lemur (*Lemur ruffrons*), ♂. Presented by Sir H. H. Johnston, K.C.B., F.Z.S.
1 Serval (*Felis serval*). From Nyasaland. Presented by Sir H. H. Johnston, K.C.B., F.Z.S.
2 Side-striped Jackals (*Canis lateralis*). From Nyasaland. Presented by Sir H. H. Johnston, K.C.B., F.Z.S.
1 Pale Genet (*Genetta senegalensis*). From Nyasaland. Presented by Sir H. H. Johnston, K.C.B., F.Z.S.
1 Vociferous Sea-Eagle (*Haliaëtus vocifer*). From Nyasaland. Presented by Sir H. H. Johnston, K.C.B., F.Z.S.
1 Black-and-White Sparrow-Hawk (*Accipiter melanoleucus*). From Nyasaland. Presented by Sir H. H. Johnston, K.C.B., F.Z.S.
1 Whinchat (*Pratincola rubetra*). Presented by John Young, Esq., F.Z.S.
1 Redstart (*Ruticilla phœnicurus*). Presented by John Young, Esq., F.Z.S.
1 Blackcap (*Sylvia atricapilla*). Presented by John Young, Esq., F.Z.S.
1 Swallow (*Hirundo rustica*). Presented by John Young, Esq., F.Z.S.
1 Cape Viper (*Causus rhombeatus*). Presented by F. V. Kirby, Esq., F.Z.S.
1 Rufescent Snake (*Leptodira hotambœia*). Presented by F. V. Kirby, Esq., F.Z.S.
6. 2 Globose Curassows (*Crax globicera*), ♂ ♀. Presented by Mrs. Sedgwick.
2 Collared Fruit-Bats (*Cynonycteris collaris*). Born in the Menagerie.
7. 2 Hairy Armadillos (*Dasypus villosus*). Deposited.
1 Peba Armadillo (*Tatusia peba*). Deposited.
9. 2 Maguari Storks (*Dissura maguari*). Purchased.
3 Franklin's Gulls (*Larus franklini*). Purchased. See P. Z. S. 1896, p. 782.
10. 2 Lions (*Felis leo*), ♂ ♀. Presented by C. A. Osborne, Esq.
11. 1 Smooth Snake (*Coronella austriaca*). Presented by A. E. T. Jourdain, Esq.
12. 5 Spotted Salamanders (*Salamandra maculosa*). Presented by Miss Mink.
13. 1 Bonnet-Monkey (*Macacus sinicus*), ♂. Presented by Dr. Allen M. Cleghorn.
1 Yellow-cheeked Lemur (*Lemur xanthomystax*). Deposited.
1 Wild Cat (*Felis catus*). Presented by Lord Lilford.
1 Common Genet (*Genetta vulgaris*). Presented by Lord Lilford.
3 Prairie Marmots (*Cynomys ludovicianus*). Presented by Lord Lilford.
1 Grey Coly Shrike (*Hypocolius ampelinus*). Presented by Lord Lilford.
1 Cat-bird (*Galeoscoptes carolinensis*). Presented by Lord Lilford.
1 Sulphury Tyrant (*Pitangus sulphuratus*). Presented by Lord Lilford.
2 Greater Black-backed Gulls (*Larus marinus*). Presented by Lord Lilford.
1 Herring-Gull (*Larus argentatus*). Presented by Lord Lilford.
1 Black-headed Gull (*Larus ridibundus*). Presented by Lord Lilford.

Oct. 13. 2 Hybrid Gulls. Presented by Lord Lilford.
2 Avocets (*Recurvirostra avocetta*). Presented by Lord Lilford.
2 Eyed Lizards (*Lacerta ocellata*). Presented by Lord Lilford.
7 Green Lizards (*Lacerta viridis*). Presented by Lord Lilford.
14. 2 Tigers (young) (*Felis tigris*), 2 ♀. Presented by H.H. The Gaekwar of Baroda.
2 Nylghaies (*Boselaphus tragocamelus*), ♂ ♀. Received in Exchange.
2 Grey Francolins (*Francolinus ponticerianus*). Presented by Lieut.-Col. D. K. Robertson.
15. 1 Algerian Tortoise (*Testudo ibera*). Deposited.
16. 1 Loggerhead Turtle (*Thalassochelys caretta*). Presented by Miss A. Steer.
20. 3 Purple-faced Monkeys (*Semnopithecus leucoprymnus*). Presented by W. G. Bligh, Esq.
1 Rhesus Monkey (*Macacus rhesus*). Presented by W. G. Bligh, Esq.
1 Bay Bamboo-Rat (*Rhizomys badius*). Presented by W. G. Bligh, Esq.
1 Mouse (*Mus*, sp. inc.). Presented by W. G. Bligh, Esq.
3 Douraca Doves (*Turtur douraca*). Presented by W. G. Bligh, Esq.
11 Burmese Tortoises (*Testudo elongata*).
7 Flat-backed Tortoises (*Testudo platynota*).
3 Ceylonese Terrapins (*Clemmys trijuga*, var. *edeniana*).
4 Shielded River-Turtles (*Emyda scutata*).
5 Cocteau's Geckos (*Hemidactylus cocteaui*).
12 Verticillated Geckos (*Gecko verticillatus*).
6 Yellowish Monitors (*Monitor flavescens*).
6 Doria's Lizards (*Mabuia doriæ*).
3 Bell's Lizards (*Liolepis belliana*).
6 Emma's Lizards (*Calotes emma*).
1 Hamadryad (*Naia bungarus*).
1 Indian Cobra (*Naia tripudians*).
1 Banded Bungarus (*Bungarus fasciatus*).
11 Green Pit-Vipers (*Lachesis gramineus*).
4 Grass-green Tree-Snakes (*Dryophis prasina*).
2 Sharp-snouted Snakes (*Dryophis mycterizans*).
2 Ornamented Tree-Snakes (*Chrysopelea ornata*).
5 Robed Snakes (*Tropidonotus stolatus*).
2 Fishing-Snakes (*Tropidonotus piscator*).
1 Rayed Snake (*Coluber radiatus*).
1 Condanar Sand-Snake (*Psammophis condanarus*).
2 Well-spotted Snakes (*Dipsodomorphus multimaculatus*).
2 Olivaceous Water-Snakes (*Hypsirhina enhydris*).
1 Aulic Snake (*Lycodon aulicus*).
Presented by W. G. Bligh, Esq. See P.Z.S.1896, p. 782
Presented by W G. Bligh, Esq. See P.Z.S.1896, p. 782.
1 Blainville's Horned Lizard (*Phrynosoma blainvillii*). Presented by Miss Noyes Lewis.
2 Panolia Deer (*Cervus eldi*). Purchased.
21. 2 Virginian Eagle-Owls (*Bubo virginianus*). Purchased.

Oct. 21. 1 Algerian Tortoise (*Testudo ibera*). Presented by Mr. R. M. C. Souper.
22. 1 Black Wallaby (*Macropus ualabatus*), ♂. Presented by Malcolm Watson, Esq.
23. 1 Black Lemur (*Lemur macaco*), ♂. Presented by Capt. H. Talboys.
1 Great Eagle-Owl (*Bubo maximus*). Received in Exchange.
24. 1 Yellow-cheeked Lemur (*Lemur xanthomystax*). Presented by H. O. Townshend, Esq.
1 Smith's Dwarf Lemur (*Microcebus smithi*). Presented by Dr. Hubert E. J. Biss.
27. 1 Syrian Bear (*Ursus syriacus*), ♀. Presented by G. A. Schenley, Esq.
1 Cassowary (*Casuarius* sp. inc.). Deposited.
2 Common Sheldrakes (*Tadorna cornuta*). Received in Exchange.
3 Mandarin Ducks (*Æx galericulata*). Received in Exchange.
1 White-faced Tree-Duck (*Dendrocygna viduata*). Received in Exchange.
29. 1 Mozambique Monkey (*Cercopithecus pygerythrus*), ♂. Presented by Dr. John Archibald.
1 Hocheur Monkey (*Cercopithecus nictitans*), ♂. Presented by the Rev. Lawson Forfeitt, F.R.G.S.
30. 1 Garden Dormouse (*Myoxus quercinus*). Presented by W. H. St. Quintin, Esq., F.Z.S.
1 Night-Heron (*Nycticorax griseus*). Deposited.
2 Purple Herons (*Ardea purpurea*). Deposited.
4 European Tree-Frogs (*Hyla arborea*). Presented by Mrs. Kneeshaw.
31. 2 White Storks (*Ciconia alba*). Presented by Miss Agnes Woodroffe.
1 Black-backed Piping-Crow (*Gymnorhina tibicen*). Presented by Charles G. Murrell, Esq.
2 Black-spotted Teguexins (*Tupinambis nigro-punctatus*). Deposited.

Nov. 2. 2 Chacma Baboons (*Cynocephalus porcarius*), ♂ ♀. Presented by Capt. Baker.
2 Black Swans (*Cygnus atratus*). Purchased.
3. 1 One-streaked Hawk (*Melierax monogrammicus*). Presented by Mrs. Palmer.
4. 1 Oyster-catcher (*Hæmatopus ostralegus*). Presented by Miss Beatrix Martin.
5. 1 Black-eared Marmoset (*Hapale penicillata*). Deposited.
2 Ortolan Buntings (*Emberiza hortulana*). Presented by John Young, Esq., F.Z.S.
2 Coscoroba Swans (*Coscoroba candida*). Purchased.
6. 2 Choughs (*Pyrrhocorax graculus*). Deposited.
7. 1 Grand Galago (*Galago crassicaudata*). Presented by Mrs. Le Poer Richardson.
9. 1 Himalayan Bear (*Ursus tibetanus*), ♂. Presented by Alfred W. Alcock, Esq., M.B., C.M.Z.S.
3 European Pond-Tortoises (*Emys orbicularis*). Presented by Arthur Baring, Esq.
10. 1 Virginian Opossum (*Didelphys virginiana*). Presented by Edward Johnson, Esq.

Nov. 10. 1 Diana Monkey (*Cercopithecus diana*). Presented by Mrs. T. Skottowe.
1 Campbell's Monkey (*Cercopithecus campbelli*). Presented by Mrs. T. Skottowe.
11. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mrs. Mouillot.
13. 1 Green-cheeked Amazon (*Chrysotis viridigena*). Purchased.
1 Malaccan Parrakeet (*Palæornis longicauda*), ♂. Purchased.
1 Cocteau's Skink (*Macroscincus cocteaui*). Received in Exchange.
1 Gay's Frog (*Calyptocephalus gayi*). Received in Exchange.
14. 1 Great Eagle-Owl (*Bubo maximus*). Deposited.
16. 1 Red-bellied Squirrel (*Sciurus variegatus*). Presented by James Meldrum, Esq., F.Z.S.
17. 1 Sykes's Monkey (*Cercopithecus albigularis*), ♂. Presented by Mrs. Gooding.
1 White-fronted Lemur (*Lemur albifrons*). Presented by Richard A. Todd, Esq.
1 Hawk's-billed Turtle (*Chelone imbricata*). Deposited.
19. 1 Squirrel Monkey (*Chrysothrix sciurea*). Presented by James W. Wells, Esq.
20. 1 Vulpine Phalanger (*Trichosurus vulpecula*), ♀. Presented by George Turner, Esq.
1 Mute Swan (*Cygnus olor*). Presented by J. Culling, Esq.
21. 2 Brown Mynahs (*Acridotheres fuscus*). Presented by Geo. H. Nowell, Esq., M.B.
25. 1 Leopard (*Felis pardus*), ♀. Presented by Surg.-Major N. Manders.
27. 2 Tigers (*Felis tigris*), 2 ♂. Presented by Capt. Alex. W. Thorneycroft, Royal Scots Fusiliers.
1 Ring-tailed Coati (*Nasua rufa*). Purchased.
1 King Vulture (*Gypagus papa*). Purchased.
1 Scolopaceous Courlan (*Aramus scolopaceus*). Purchased.
3 Violaceous Night-Herons (*Nycticorax violaceus*). Purchased.
28. 1 Malabar Squirrel (*Sciurus maximus*). Presented by G. W. Vidal, Esq.
1 Impeyan Pheasant (*Lophophorus impeyanus*), ♀. Purchased.
30. 1 Arabian Gazelle (*Gazella arabica*), ♂. From Aden. Presented by R. G. Buchanan, Esq. See P.Z.S. 1896, p. 981.
2 Laughing Kingfishers (*Dacelo gigantea*). Presented by F. Beaumont, Esq.
1 Hybrid Common Pintail and Wigeon (bred between *Dafila acuta* ♀ and *Mareca penelope* ♂). Presented by Sir Edward Grey, Bart., M.P.
1 Thick-necked Tree-Boa (*Epicrates cenchris*). Deposited.

Dec. 1. 1 Green Tree-Frog (*Hyla arborea*, var. *meridionalis*). Deposited.
2. 1 Golden Eagle (*Aquila chrysaëtus*). Presented by Lord Arthur Cecil.
1 Buzzard (*Buteo vulgaris*). Presented by Lord Arthur Cecil.
2 Raccoons (*Procyon lotor*). Presented by Lord Arthur Cecil.
3. 5 Eyed Lizards (*Lacerta ocellata*). Presented by P. Goupille, Esq.
2 Vinaceous Turtle-Doves (*Turtur vinaceus*). Bred in the Menagerie.
1 Spotted Pigeon (*Columba maculosa*). Bred in the Menagerie.
4. 2 White-thighed Colobus (*Colobus vellerosus*), ♂ ♀. Presented by Capt. H. D. Larymore, C.M.G.

Dec. 4. 1 Campbell's Monkey (*Cercopithecus campbelli*), ♂. Presented by Capt. C. H. Armitage.
1 Green Monkey (*Cercopithecus callitrichus*), ♂. Presented by Capt. C. H. Armitage.
6. 1 Black-headed Lemur (*Lemur brunneus*), ♂. Presented by Miss Baird.
1 Lesser White-nosed Monkey (*Cercopithecus petaurista*), ♂. Presented by Miss Baird.
7. 2 Maned Geese (*Chenonetta jubata*), ♂ ♀. Purchased.
10. 2 White's Tree-Frogs (*Hyla cærulea*). Presented by F. E. Blaauw, Esq., C.M.Z.S.
1 Changeable Tree-Frog (*Hyla versicolor*). Presented by F. E. Blaauw, Esq., C.M.Z.S.
12. 1 Grey Ichneumon (*Herpestes griseus*). Presented by Col. Smythe.
14. 3 Varied Field-Rats (*Isomys variegatus*).
3 Larger Egyptian Gerbilles (*Gerbillus pyramidum*).
9 Lesser Egyptian Gerbilles (*Gerbillus ægyptius*).
3 Long-eared Hedgehogs (*Erinaceus auritus*).
46 Egyptian Geckos (*Tarentola annularis*).
5 Fan-footed Geckos (*Ptyodactylus lobatus*).
1 Grey Monitor (*Varanus griseus*).
5 Cerastes Vipers (*Cerastes cornutus*).
6 Square-marked Toads (*Bufo regularis*).
} From Egypt. Received in Exchange.
15. 1 Rufescent Rat-Kangaroo (*Æpyprymnus rufescens*). Presented by Capt. N. Allan.
1 Jelerang Squirrel (*Sciurus bicolor*). Presented by Capt. G. C. Candy, R.N.R.
2 Black-bellied Sand-Grouse (*Pterocles arenarius*). Presented by Gerard P. Torrens, Esq., F.Z.S. From Spain.
16. 2 Nicobar Pigeons (*Calœnas nicobarica*), ♂ ♀. Deposited.
1 Canarian Pigeon (*Columba laurivora*). Deposited.
17. 3 Herring-Gulls (*Larus argentatus*). Presented by J. W. Wilkes, Esq.
18. 1 Suricate (*Suricata tetradactyla*). Deposited.
19. 1 Levaillant's Cynictis (*Cynictis levaillanti*). Presented by Joseph Francis, Esq.
11 Harvest-Mice (*Mus minutus*). Presented by Capt. Salvin.
21. 1 Golden Eagle (*Aquila chrysaëtus*). Presented by the Lord William Beresford, V.C.
22. 2 European Tree-Frogs (*Hyla arborea*). Presented by Master Kneeshaw.
23. 1 Raven (*Corvus corax*). Presented by J. Callingham, Esq.
24. 1 Grey Parrot (*Psittacus erithacus*). Deposited.
29. 1 West-African Love-bird (*Agapornis pullaria*), ♀. Presented by Miss E. N. Tuely.
31. 2 Grooved Tortoises (*Testudo calcarata*). Deposited.
6 Grooved Tortoises (*Testudo calcarata*). Deposited.
1 Bearded Lizard (*Amphibolurus barbatus*). Deposited.
7 Muricated Lizards (*Amphibolurus muricatus*). Deposited.
2 Blue-tongued Lizards (*Tiliqua scincoides*). Deposited.
8 Labillardiere's Lizards (*Lygosoma labillardieri*). Deposited.
6 Lesueur's Water-Lizards (*Physignathus lesueuri*). Deposited.
4 Limbless Lizards (*Pygopus lepidopus*). Deposited.
1 Death-Adder (*Acanthopis antarcticus*). Deposited.
1 Purplish Death-Adder (*Pseudechis porphyriacus*). Deposited.
1 Shielded Death-Adder (*Notechis scutatus*). Deposited.
3 Australian Banded Snakes (*Diemenia nuchalis*). Deposited.

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Any Fellow, having paid all fees due to the Society, is at liberty to withdraw his name upon giving notice in *writing* to the Secretary.

Persons who wish to become Fellows of the Society are requested to communicate with the undersigned.

PHILIP LUTLEY SCLATER, M.A., Ph.D., F.R.S.,
Secretary.

3 Hanover Square, London, W.,
October, 1896.

MEETINGS

OF THE

ZOOLOGICAL SOCIETY OF LONDON

FOR

SCIENTIFIC BUSINESS.

(AT 3 HANOVER SQUARE, W.)

Session 1896–1897.

1896.

Tuesday, November 17	Tuesday, December 1 and 15

1897.

Tuesday, January 19	Tuesday, April .. 6
„ February 2 and 16	„ May .... 4 and 18
„ March .. 2 „ 16	„ June .... 1 and 15

The Chair will be taken at half-past Eight o'clock in the Evening precisely.

BRITISH MUSEUM 11 N096

PROCEEDINGS

OF THE

GENERAL MEETINGS FOR SCIENTIFIC BUSINESS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON

FOR THE YEAR

1896.

PART I.

CONTAINING PAPERS READ IN

JANUARY AND FEBRUARY.

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The present skulls resemble those of recent Lemmings very closely indeed, but, like the specimens found in the Somersetshire caves, they are smaller than those of large adult recent animals. I cannot, however, find any characters sufficiently important to enable me to separate the two specifically.

In conclusion, I should like to draw attention to the following statement, which is to be found on pages 147 and 148 of Messrs. Abel Chapman and W. J. Buck's work on 'Wild Spain' (chapter xii.). Writing of Ibex-shooting in the Sierra de Grédos of Old Castile, these authors remark:—"One day, close to the snow-line, we came across a fat, blue-grey, little beastie, apparently of the Dormouse tribe (*Liron*, in Spanish), but he got to earth, or rather rock, ere we could capture him." This description is too vague to enable me to do more than to make a suggestion, and the suggestion that Lemmings exist in Spain at the present day is too startling to be lightly brought forward; but I should like to point out that the description would apply very well to *Myodes schisticolor*—a species which (if it really be a good species) is, I believe, only distinguishable from *M. lemmus* by its bluish-grey colour.

At all events, in view of Dr. Gadow's remarkable discovery of fresh-looking Lemming bones on comparatively low ground, it would be interesting to know what is the true nature of the "fat, blue-grey, little beastie"; and I venture to express a hope that this animal will be found to be a Lemming or a Vole, and

[1] W. A. Sandford, in Quart. Journ. Geol. Soc. vol. xxvi. (1870), p. 125, pl. viii. fig. 3; and Dove, Somerset. Nat. Hist. Soc. vol. xv. (1870), p. 55.

[2] H. P. Blackmore and E. B. Aston, in P. Z. S. 1874, pp. 460–471.

[3] Zeitschr. deutsch. geol. Gesell. vii. (1855), pp. 488–501; also at Wolfenbüttel, A. Nehring in Zeitschr. für ges. Naturwis. Bd. xlv. (1875), and in Kent, E. T. Newton, Geol. Mag. 1890, p. 452, and Quart. Journ. Geol. Soc. vol. l. p. 188 (1894).

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NOTICE.

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II. " " " March and April, on August 1st.
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PROCEEDINGS

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OF LONDON

FOR THE YEAR

1896.

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